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# Screening of Elevated Blood Pressure in Patients Attending Endodontic Clinics: A Cross-sectional Study

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**Abstract**

**One of the most important cardiovascular conditions that account for the highest mortality rate around the world is hypertension. It is defined as a condition where systolic and diastolic blood pressure values are ≥140 mmHg and ≥90 mmHg, respectively, or the use of an antihypertensive drug is being made. This study aims to identify and report the prevalence of elevated blood pressure levels among patients attending an endodontics clinic. The study was conducted among a group of 100 patients who sought endodontic treatment at university hospital, endodontics department. The collected information included blood pressure measurement and answers to a structured interview about their health and medication history. The collected data showed that among the 100 patients screened, 10 % exhibited elevated blood pressure. Of these, 1 % were previously undiagnosed, 9 % reported a history of hypertension, and only 2 % were on antihypertensive medication. Male patients had a higher mean systolic blood pressure than females, but the difference was not statistically significant ($p = 0.148$); age differed significantly by gender ($p = 0.037$). Based on this data, only 10 % of patients attending the endodontics clinic exhibited elevated blood pressure, with no statistically significant difference between genders ($p = 0.148$). The reality of unnoticed hypertension highlights the need for consistent blood pressure checks within dental practises for better detection and treatment in due time.**

*Keywords:* Hypertension, Elevated blood pressure, Dentist, Cardio-vascular diseases, Endodontics clinic

## 1. Introduction

Hypertension is identified through screening for elevated blood pressure, one of the major cardiovascular diseases, along with other disorders, has been classified as one of the top causes of death worldwide [1,2]. The screening for elevated blood pressure, and the effectiveness of treatment have significantly lowered the incidence of cardiovascular diseases and fatalities [1]. Nonetheless, because a large portion of the population does not routinely check their blood pressure, hypertension remains unrecorded, and certain patients are unable to achieve adequate control despite being on medication [3]. Regional variations in the prevalence of hypertension have been noted, possibly due to environmental causes [4]. Signs and symptoms of hypertensive cardiovascular disease and target organ damage dictate the stage of hypertension, regardless of blood pressure readings [5]. For example, indicators of progression can be microalbuminuria or signs of left ventricular hypertrophy [5]. A significant cardiovascular event unmistakably places the disease's development in a more severe

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stage [4]. Stage I hypertension that is defined at systolic blood pressure of 140–159 mmHg, and diastolic blood pressure measures between 90 and 99 mmHg, Stage II hypertension is that which is having systolic blood pressure 160 mmHg or more and diastolic blood pressure 100 mmHg or more [6]. Normal blood pressure has a standard systolic measurement of 120 mmHg and diastolic measurement of 80 mmHg [6]. Individuals showing a systolic blood pressure of 140 mmHg or more with a diastolic blood pressure less than 90 mmHg, or those under treatment with antihypertensive drugs are considered to have hypertension [7]. Blood pressure is considered high when readings are greater than normal for a specific individual on more than two different visits without factoring in time or circumstances [6]. Hypertension can be classified as either essential (primary) or secondary hypertension [7]. Primary or essential hypertension makes up 90–95 % of all cases and has no known cause [8]. In contrast, secondary hypertension, which affects an estimated 5–10 % of hypertensive patients in the United States, results from certain defined disease [6,8]. It is critical to include the diagnosis and assessment of risk factors for serious and even life-threatening systemic diseases such as head and neck cancer or hypertension, in routine dental practise [9]. Regardless, this is not a universal practise since certain dental practitioners do not understand the importance of this public health concern [9–11]. Comprehensive education is necessary for prevention of hypertension, particularly for those who are noncompliant with therapeutic measures or have pre-hypertension [10]. In this population, explaining the disease's potential risks and offering guidance on lifestyle changes like weight loss, dietary regimen to restrict hypertension, reduced salt intake, increased physical exercise, moderate drinking may help to reduce the impact on individuals' health [12]. Numerous hypertension medications exist and can be divided into different classes based on their mechanism of action [6]. Antihypertensive agents could be used as sole treatment or in combination with two or more other drugs to reach a blood pressure goal of either 150/90 mmHg, or 130–140/90 mmHg for moderate to severe renal and or diabetic patients [13]. Alongside the prescription of antihypertensive drugs, their side effects and potential interactions with other medications require careful monitoring [7]. Dentists providing patients medications for standard procedures may expose them to certain pharmacological complications [6]. Local anaesthetics, which may interact negatively with beta-blockers, are typically used during regular and operative oral treatments, either with or without the use of epinephrine [6,7]. They might give a dose of up to 0.04 mg, which equals two to four cartridges, depending on how much epinephrine is in each cartridge, to adults who are suspected to have uncontrolled hypertension and/or cardiac disease [7]. Antihypertensive drug side effects that might affect the oral health status include lichenoid responses, gingival overgrowth, changes in taste and xerostomia [2]. If any of these symptoms or indications cannot be treated, referral to a professional dental healthcare practitioner is mandatory [2]. It appears that dentists might be key figures in identifying this deadly condition [9].

The objective of this investigation was to ascertain the proportion of individuals with elevated BP that visited dental hospital for endodontic therapy and identified the proportion of those who have high blood pressure but were unaware of it. The study hypothesised that opportunistic blood pressure screening in an endodontics clinic could help identify individuals with elevated blood pressure who were previously undiagnosed or not under treatment.

## 2. Materials and methods

### 2.1. Study design and sampling

This pilot study was conducted as a cross-sectional observational study to screen for elevated blood pressure levels among patients attending an endodontic clinic. A convenience sampling technique was employed, whereby all eligible patients who attended the clinic during the study period and met the inclusion criteria were invited to participate. The study sample was not limited to individuals with known hypertension; instead, it included all eligible patients, regardless of their prior blood pressure status, to reflect a real-world opportunistic screening scenario. The study received ethical approval from the Institutional Review Board (Approval No.: 25/0052 HR), and all procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki.

### 2.2. Sample size calculation

As this was a pilot study, a formal power calculation was not conducted. The sample size of 100 participants was determined based on available clinic attendance during the study timeframe, aiming to provide initial prevalence data and assess the feasibility of implementing blood pressure screening in dental settings. This approach aligns with standard practise for exploratory, hypothesis-generating research.

### 2.3. The criteria of sample selection

#### 2.3.1. Excluded criteria

1. Smokers
2. Pregnant or breastfeeding women were excluded from the research

#### 2.3.2. Included criteria

1. Male and female patients aged 16–70 years.
2. Patients attending the endodontic clinic, regardless of prior hypertension diagnosis or current use of antihypertensive medication.

### 2.4. Protocol

The research included all patients between the ages of 16 and 70. After collecting personal information (name, age, gender, address, occupation, and marital status), the investigators asked about the chief complaint and dental history such as whether the patient had visited a dentist in the past, experienced any problems during treatment, or was a smoker. Medical history was also recorded, specifically regarding a diagnosis of hypertension. Known hypertensive patients were asked whether they were taking medication. Informed consent was obtained from all participants. A convenience sampling method was used, whereby all eligible patients attending the endodontics clinic during the study period were invited to participate.

### 2.5. Setting

This study was conducted in the Endodontics Department of a university dental hospital. Endodontic clinics frequently manage patients presenting with dental pain or infection conditions that can increase stress and transiently elevate blood pressure. This setting presents a unique opportunity for opportunistic screening of elevated blood pressure in a real-world clinical environment. For some individuals, dental visits may represent their only contact with the healthcare system, positioning dental clinics as a critical and underutilised point of entry for the early detection of cardiovascular risk factors.

### 2.6. Measuring blood pressure

Authors measured the patient's blood pressure with a digital sphygmomanometer (KH 8090, GmbH, Germany) after noting the patient's main symptoms, medical history, and dental history.

In this study, elevated blood pressure was defined as a systolic blood pressure $\geq$140 mmHg and/or a diastolic blood pressure $\geq$90 mmHg, in accordance with international guidelines such as the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) and the World Health Organisation (WHO) recommendations.

For conducting the procedure of measuring blood pressure, the investigators have worn gloves to measure blood pressure by wrist blood pressure machine instead of a regular automatic blood pressure machine. Patients were instructed to avoid stimulants before checking blood pressure, during checking process patients were asked by the investigators not to speak, the procedure was done by putting the machine around the wrist near the thumb hitting the start button. Investigators were asked the patient to put patients' hand across their chest so it is close to the heart, the machine read systolic blood pressure, diastolic blood pressure, and heart rate.

Readings were taken after patients a minimum of 10 minutes sitting in the clinic. Patients were relaxed and stayed on dental chair. Although wrist blood pressure devices offer practical advantages in a dental clinic environment, they have inherent limitations compared to standard upper-arm measurements. To minimise measurement errors, authors ensured that patients' wrists were positioned at heart level and that standardised protocols were strictly followed. Excel (Microsoft version 14.5.20) was used to enter the data presented as percentage values.

### 2.7. Statistical analysis

The collected data were entered and analysed using SPSS version 22 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarise patient demographics and clinical characteristics, including age, gender, systolic and diastolic blood pressure, heart rate, marital status, occupation, chief complaint, family history, and antihypertensive medication use. These were reported as means ± standard deviation (for continuous variables) and frequencies with percentages (for categorical variables).

Independent sample t-tests were used to compare continuous variables such as systolic/diastolic blood pressure and heart rate between male and female patients, and between patients with and without elevated blood pressure.

One-way ANOVA was applied to examine differences across occupation and other categorical

variables. Pearson correlation analysis was undertaken to assess the relationships between age and physiological parameters (systolic BP, diastolic BP, and heart rate). Information on occupation, antihypertensive medication use, and acute dental pain was collected during the structured interviews for descriptive purposes but was not included in the statistical analysis. These variables were excluded due to heterogeneous responses, lack of standardised measurement such as pain severity, or limited subgroup sizes that would restrict meaningful statistical comparison in this pilot setting. A P value of less than 0.05 was considered statistically significant.

## 3. Results and discussion

A total of 100 participants were included in the study. The mean age was 39.02 years (SD = 13.9), with a range of 16–70 years. The sample consisted of 62 % females (n = 62) and 38 % males (n = 38). Among all participants, 58 % were married and 42 % were single. Only 2 % reported current use of antihypertensive medication, while 9 % had a known history of hypertension. Acute dental pain was reported by 67 % of the participants as their chief complaint. No participants reported being diabetic, and smokers were excluded from the sample as per study criteria.

Table 1 summarises the descriptive statistics for the participants' physiological parameters—systolic blood pressure, diastolic blood pressure, and heart rate—including their minimum, maximum, mean values, and standard deviations.

*Table 1. Descriptive statistics of systolic and diastolic blood pressure and heart rate (N = 100).*

| Variables | Min. | Max. | Mean | SD |
|---|---|---|---|---|
| Systolic blood pressure (mmHg) | 92 | 165 | 109.20 | 17.446 |
| Diastolic blood pressure (mmHg) | 60 | 99 | 72.48 | 10.300 |
| Heart rate (bpm) | 51 | 105 | 80.02 | 11.684 |

Min.: minimum; Max.: maximum; SD: standard deviation; bpm: beats per minute.

Among the 100 participants, 62 % were female and 38 % were male. Elevated blood pressure was observed in 10 % of patients (n = 10); only 1 % were previously undiagnosed, while 9 % had a known history of hypertension. Of those with known hypertension, 2 % were taking medication, and 7 % were not under treatment. Table 2 presents mean values of age, systolic and diastolic blood pressure, and heart rate for male and female participants, along with standard deviations and P values to evaluate gender-based differences.

As shown in Table 2, male participants exhibited a higher mean systolic BP (116.05 mmHg) compared to females (105.00 mmHg), though the difference was not statistically significant (p = 0.148).

*Table 2. Comparison of blood pressure, heart rate, and age by gender (N = 100).*

| | Gender | N | Mean | SD | SE Mean | P value |
|---|---|---|---|---|---|---|
| Age (years) | Female | 62 | 36.76 | 12.48 | 1.58 | 0.037 |
| | Male | 38 | 42.71 | 15.50 | 2.51 | |
| Systolic BP (mmHg) | Female | 62 | 105.00 | 16.80 | 2.13 | 0.148 |
| | Male | 38 | 116.05 | 18.50 | 3.00 | |
| Diastolic BP (mmHg) | Female | 62 | 70.50 | 9.90 | 1.26 | 0.542 |
| | Male | 38 | 75.71 | 11.50 | 1.87 | |
| Heart rate (bpm) | Female | 62 | 82.50 | 11.80 | 1.50 | 0.132 |
| | Male | 38 | 75.97 | 10.50 | 1.70 | |

P < 0.05 was considered statistically significant. SD: standard deviation; SE: standard error; BP: blood pressure; bpm: beats per minute.

Table 3 provides a comparison of sociodemographic and clinical variables between male and female participants. These variables include marital status, chief complaint, family history of hypertension, and categorised diastolic blood pressure. Although these variables were not subjected to further statistical analysis, they offer important context for understanding the patient profiles.

*Table 3. Gender-based comparison of marital status, chief complaint, family history, and diastolic BP category (N = 100).*

| | Gender | N | Mean | SD | SE Mean | P value |
|---|---|---|---|---|---|---|
| Marital Status | Female | 62 | 1.76 | 0.432 | 0.055 | NS |
| | Male | 38 | 1.84 | 0.370 | 0.060 | |
| Chief Complaint | Female | 62 | 1.55 | 0.717 | 0.091 | NS |
| | Male | 38 | 1.61 | 0.495 | 0.080 | |
| Family history of hypertension | Female | 62 | 5.00 | 4.523 | 0.574 | NS |
| | Male | 38 | 4.00 | 4.013 | 0.651 | |
| Diastolic blood pressure (code)[a] | Female | 62 | 1.29 | 0.524 | 0.067 | NS |
| | Male | 38 | 1.37 | 0.751 | 0.122 | |

SD: standard deviation; SE: standard error of the mean; NS: not significant. Marital status was coded as: 1 = Single, 2 = Married. Family history of hypertension indicates the number of first-degree relatives reported to have hypertension.

[a] Diastolic blood pressure values were categorised as follows: 1 = less than 80 mmHg; 2 = 80–89 mmHg; 3 = 90–99 mmHg.

The mean age of participants in this study was 39.02 years. Systolic blood pressure ranged from 99 mmHg to 165 mmHg, diastolic pressure ranged from 60 mmHg to 99 mmHg, and heart rate ranged from 51 to 105 beats per minute. Table 4 presents the frequency distribution of systolic and diastolic blood pressure categories, as well as heart rate

classifications, based on standard clinical thresholds from the JNC 7 guidelines. This categorisation allows for the identification of patients with normal readings, pre-hypertension, and various stages of hypertension, along with resting heart rate profiles.

*Table 4. Frequency distribution of blood pressure and heart rate categories based on JNC 7 criteria (N = 100).*

| Blood pressure category | Range | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Systolic BP (mmHg)** | | | |
| Normal | <120 | 87 | 87.0 % |
| Prehypertension | 120–139 | 2 | 2.0 % |
| Stage I hypertension | 140–159 | 8 | 8.0 % |
| Stage II hypertension | ≥160 | 3 | 3.0 % |
| **Diastolic BP (mmHg)** | | | |
| Normal | <80 | 76 | 76.0 % |
| Prehypertension | 80–89 | 16 | 16.0 % |
| Stage I hypertension | 90–99 | 8 | 8.0 % |
| **Heart rate (bpm)** | | | |
| Low | <70 | 20 | 20.0 |
| Normal | 70–89 | 58 | 58.0 |
| Elevated | ≥90 | 22 | 22.0 |

BP: blood pressure; bpm: beats per minute. Classification of blood pressure categories is based on JNC 7 criteria. Systolic and diastolic measurements were taken after a 10 minutes resting period using a validated wrist sphygmomanometer.

To explore the potential impact of age on physiological parameters, a Pearson correlation analysis was conducted between age and systolic blood pressure (SP), diastolic blood pressure (DP), and heart rate (HR). Table 5 presents the Pearson correlation coefficients along with P values, showing the strength and direction of these associations. A moderate positive correlation was observed between age and systolic blood pressure ($r = 0.35$, $p = 0.001$), and a weak but significant correlation with diastolic pressure ($r = 0.24$, $p = 0.015$). No significant correlation was found between age and heart rate ($r = -0.06$, $p = 0.56$).

*Table 5. Pearson correlation between age and systolic blood pressure, diastolic blood pressure, and heart rate (N = 100).*

| Variable | Pearson Correlation Coefficient (*r*) | P value | Interpretation |
|---|---|---|---|
| Age vs. Systolic Blood Pressure (SP) | 0.35 | 0.001** | Moderate positive correlation |
| Age vs. Diastolic Blood Pressure (DP) | 0.24 | 0.015* | Weak positive correlation |
| Age vs. Heart Rate (HR) | −0.06 | 0.560 | No significant correlation |

*p < 0.05, **p < 0.01.

To distinguish between patients with and without elevated blood pressure, the study compared their mean systolic and diastolic blood pressure readings, as well as heart rate. Table 6 presents these comparisons, including sample sizes (n = 10 for elevated BP; n = 90 for normal BP), mean values with standard deviations, and P values based on independent-sample t-tests.

*Table 6. Comparison of blood pressure and heart rate between patients with and without elevated BP (N = 100).*

| Parameter | Elevated BP (n = 10) | Normal BP (n = 90) | P value |
|---|---|---|---|
| Systolic pressure (SP) | 148.7 ± 9.2 mmHg | 104.3 ± 10.5 mmHg | <0.001 |
| Diastolic pressure (DP) | 94.1 ± 5.6 mmHg | 70.2 ± 7.8 mmHg | <0.001 |
| Heart rate (HR) | 88.3 ± 10.7 bpm | 78.5 ± 10.2 bpm | 0.015 |

BP = blood pressure; mmHg = millimetres of mercury; bpm = beats per minute. Statistical comparisons were performed using independent-sample t-tests.

The study hypothesis was rejected based on the current findings, as the endodontics clinic demonstrated a potential to serve as a setting for opportunistic screening of elevated blood pressure (BP). In general, limited research has focused on the prevalence of hypertension among individuals receiving dental care, particularly in the context of endodontic treatment [9,14]. In our study, 10 % of patients treated in the endodontics clinic were found to have elevated BP, and 1 % of them were previously unaware of their condition [9,15,16].

A previous study by Michael *et al.* reported a higher prevalence of elevated blood pressure in patients attending general dental clinics, suggesting that such visits could serve as effective touchpoints for opportunistic screening [17]. In contrast, our study conducted in a specialised endodontics setting revealed a much lower proportion of patients with elevated blood pressure. This discrepancy may be attributed to differences in patient profiles and visit purposes: general dental visits often include preventive care or routine examinations, potentially attracting individuals less familiar with their health status. In contrast, patients attending endodontic clinics are often referred for specific procedures and may already be under regular medical supervision. These findings highlight the importance of tailoring public health interventions to the clinical context rather than assuming uniform opportunities for screening across all dental subfields.

Our results also support prior observations indicating significant gaps in hypertension awareness and management. Although the prevalence of severe hypertension may be decreasing, a substantial proportion of hypertensive individuals remain untreated-estimated at nearly 50 % in various studies [18,19]. This raises concern regarding the effectiveness of current screening strategies and the need for multidisciplinary healthcare engagement [20,21]. Dental professionals, particularly those involved in invasive procedures such as endodontics, should be adequately trained to detect elevated BP and refer patients appropriately [9]. Furthermore, implementing stress-reduction protocols before or after dental procedures may help mitigate hypertension-related complications [9,19].

The correlation analysis in this study showed a significant association between increasing age and both systolic and diastolic blood pressure, which aligns with existing literature on age-related vascular changes. Although no significant relationship was found between age and heart rate, these findings reinforce the importance of age-based screening strategies for hypertension in dental settings. These findings suggest that age may be a contributing factor to elevated blood pressure levels among dental patients.

The collected data revealed that patients with elevated blood pressure had significantly higher systolic and diastolic values compared to those with normal BP ($p < 0.001$). Their heart rate was also significantly elevated ($p = 0.015$), which may reflect physiological stress or underlying cardiovascular strain. These findings validate the study's blood pressure classification approach and reinforce the clinical relevance of opportunistic BP screening in dental settings.

Interprofessional collaboration plays a key role in promoting shared responsibility among healthcare providers for identifying systemic health risks. In this context, blood pressure monitoring during dental visits can serve as an effective tool to strengthen medical-dental integration, especially for patients who may not routinely engage with primary care services [22].

Dentists can proactively participate in early hypertension detection by reviewing patients' medical records, conducting risk assessments, and initiating referrals where necessary [8]. In this study, male patients with elevated BP were found to have experienced more tooth loss than their female counterparts. This trend is consistent with previous literature suggesting systemic connections between hypertension, poor dental health, and tooth retention [3,9,21]. Additionally, prior studies suggest that hypertensive smokers are more likely to undergo root canal treatments and suffer from apical periodontitis [4,9]. However, due to our limited smoker subgroup, this association was not strongly evident in our sample.

Recognising risk indicators that predispose individuals to hypertensive complications and guiding them toward appropriate management is vital [8]. Furthermore, several antihypertensive medications may interfere with materials used in dental procedures, presenting additional considerations for treatment planning [2]. In this respect, oral healthcare providers are well-positioned to improve the care of patients with poorly controlled hypertension [7]. For example, the use of minimal sedation techniques such as midazolam may be beneficial in reducing anxiety-induced hypertensive episodes during dental procedures [9].

Before initiating any endodontic intervention, clinicians must record and assess patients' medical conditions to ensure safe care delivery [23]. The current study reinforces the need for dental professionals to be knowledgeable about BP reference values and to incorporate BP screening protocols in clinical practise. This research supports the broader public health initiative of increasing awareness and early detection of hypertension through dental visits [18].

To increase dental recruitment and the number of patients with various socioeconomic and educational backgrounds that dentists serve, this effort will enable dentists to spread awareness of this silent-killer illness [9,19].

Blood pressure monitoring in endodontic clinics is not only essential for interdisciplinary care but also crucial for minimising potential intraoperative and postoperative complications [6]. Endodontic procedures, particularly those involving anxiety or local anaesthesia, can influence hemodynamic responses, and untreated elevated BP may increase the risk of cardiovascular events during or after treatment [7].

Although information was collected on additional variables such as occupation, use of anti-hypertensive medication, and acute dental pain, these were not included in the statistical analysis. This was due to their limited relevance to the primary objective of the study, the lack of standardised measurement criteria for certain variables (particularly pain severity), and the small size of subgroups, which limited meaningful statistical comparison. These variables were retained for descriptive reporting only.

The main limitations of this study include the difficulty in obtaining a comprehensive medical

history from each patient, the challenge of recruiting participants without systemic diseases, a limited data collection timeframe, and the use of a wrist-based sphygmomanometer, which may offer lower accuracy compared to upper-arm devices.

### 3.1. Limitation

Although patients were rested for at least 10 minutes before measurement, the fact that readings were taken in the dental operatory may still have introduced mild stress-related elevations. Recording blood pressure in a neutral, pre-operative waiting area would likely provide a more accurate reflection of baseline readings.

Future research should aim for a larger sample size and greater demographic diversity to enhance external validity. It is also recommended to validate wrist-based readings against simultaneous upper-arm measurements to ensure accuracy in the dental setting. Extending the study duration will allow better observation of elevated BP screening trends among dental patients. Additionally, including smokers in future cohorts is important to capture their cardiovascular risk profile and assess the influence of smoking on blood pressure screening outcomes in endodontic clinics.

## 4. Conclusions

The current findings suggest that endodontic clinics can play a critical role in the opportunistic detection of elevated blood pressure. This reinforces the importance of assessing a patient's systemic health status particularly blood pressure—before initiating dental procedures such as root canal treatment. Moreover, the results underscore the value of fostering interprofessional collaboration in dental settings to safeguard both oral and systemic health. Identifying elevated blood pressure in dental environments could potentially reduce risks associated with cardiovascular events during or after treatment.

## Author Contribution

All authors have made equal contributions to this research work.

## Ethics Information

This study was approved by the Institutional Review Board (Approval No.: 25/0052 HR) and conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all adult participants; for participants aged 16–17 years, written parental/guardian consent and participant assent were obtained.

## AI Usage Declaration

The authors declare that the content of this work was not generated using AI.

## Funding Information

No specific funding was received for conducting this research.

## Conflicts of Interest

The authors declare that there is no conflict of interest.

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