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Original Article

Burden of Undiagnosed Hypertension Among Adult Patients Undergoing Elective Surgery: A Cross-Sectional Study

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ABSTRACT

Background: Hypertension is a major global public health problem and a leading risk factor for cardiovascular disease, stroke, and premature mortality. Despite being largely asymptomatic, undiagnosed hypertension remains common worldwide, making preoperative assessment an important opportunity for early detection and timely management. **Objective:** The aim of the study was to determine the burden of undiagnosed hypertension among adult patients undergoing elective surgery. **Methods & Materials:** This cross-sectional study was conducted in the Department of Anaesthesia, Analgesia and Intensive Care Medicine at Bangladesh Medical University (BMU), Dhaka, Bangladesh, from April 2024 to March 2025 among 2,084 adult patients attending the Preoperative Assessment Unit (PAU) for elective surgery using purposive sampling. The study assessed the burden of undiagnosed hypertension, including white coat and coincidental hypertension, using a structured data sheet with predefined variables. Data were analyzed using SPSS version 27.0. **Results:** Among 2,084 adult patients undergoing elective surgery, 445 (21.4%) were hypertensive, 1,561 (74.9%) were normotensive, and 78 (3.7%) had undiagnosed hypertension. Age and gender were significantly associated with hypertension status ($p < 0.001$ and $p = 0.013$). Among 1,639 patients without a previous diagnosis of hypertension, 78 (4.8%) had undiagnosed hypertension, including 26 (33.3%) with white coat hypertension and 52 (66.7%) with coincidental hypertension. **Conclusion:** Routine preoperative blood pressure screening is valuable for identifying undiagnosed hypertension and facilitating timely management to improve perioperative and long-term cardiovascular outcomes.

Keywords: *Hypertension, Elective Surgery, Preoperative Assessment.*

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INTRODUCTION

Hypertension is a major global public health problem and a leading risk factor for cardiovascular disease, stroke, and premature mortality. According to the World Health Organization, more than one billion adults worldwide have elevated blood pressure, and this number continues to increase because of population ageing and epidemiological transitions in low- and middle-income countries [1]. Hypertension accounts for over seven million deaths annually and substantially increases the risk of myocardial infarction, heart failure, renal failure, and cerebrovascular disease [2,3]. It has been recognized as the leading global risk factor for mortality and the third leading contributor to the global burden of disease [4,5], with raised blood pressure responsible for approximately nine million deaths each year [6,7].

Despite its considerable public health impact, hypertension is often asymptomatic and may remain undiagnosed for many years, earning it the designation of the "silent killer" [8,9]. Therefore, surveillance of both diagnosed and undiagnosed hypertension is essential to reduce complications and guide effective interventions [10]. Undiagnosed hypertension remains a major concern worldwide. In the United States, nearly one in six adults with hypertension are unaware of their condition, while in China only 44.7% of hypertensive individuals know their status [11]. Similarly, a systematic review in Sub-Saharan Africa found that only 27% of individuals with hypertension were aware of their diagnosis, highlighting the need to improve detection and treatment of this condition [12].

Elevated blood pressure is the most common perioperative comorbidity among patients undergoing non-cardiac surgery, with a prevalence of 20–25%, and remains inadequately controlled in many low- and middle-income countries [13,14]. The preanesthesia evaluation provides an important opportunity to detect previously undiagnosed or poorly controlled hypertension before elective surgery. Identification of elevated blood pressure during this assessment assists in perioperative cardiovascular risk stratification [15], anesthetic planning, and initiation of long-term antihypertensive management when indicated [1,16]. Differentiating chronic hypertension from white-coat hypertension and true uncontrolled hypertension is also essential, as perioperative blood pressure variability is independently associated with adverse outcomes [17].

The reported prevalence of hypertension in preanesthesia clinics varies widely because of differences in study populations, diagnostic criteria, blood pressure measurement methods, and sampling techniques [16]. Although hypertension is commonly diagnosed in primary healthcare settings, the perioperative period offers a valuable opportunity, particularly in resource-limited countries, to identify previously undiagnosed hypertension, initiate appropriate treatment, and arrange long-term follow-up, thereby reducing cardiovascular morbidity and mortality [18,19]. In developing countries such as Ethiopia, awareness of hypertension remains low despite its high prevalence, and evidence on undiagnosed hypertension is still limited [20]. Therefore, this study aimed to determine the burden of undiagnosed hypertension and its associated factors among adult patients undergoing elective surgery at Bangladesh Medical University (BMU).

OBJECTIVE

To determine the burden of undiagnosed hypertension among adult patients undergoing elective surgery.

METHODS & MATERIALS

This cross-sectional study was conducted in the Department of Anaesthesia, Analgesia and Intensive Care Medicine at Bangladesh Medical University (BMU), Dhaka, Bangladesh, from April 2024 to March 2025. A total of 2,084 adult patients attending the Preoperative Assessment Unit (PAU) for elective surgery were included using a purposive sampling technique based on predefined inclusion and exclusion criteria to evaluate the burden of undiagnosed hypertension, including white coat and coincidental hypertension, among adult patients undergoing elective surgical procedures.

Inclusion criteria:

- Patients aged ≥18 years
- ASA physical status I–III
- Patients undergoing elective surgery

Exclusion criteria:

- Emergency surgical cases
- Patients with cognitive impairment or inability to provide informed consent
- History of alcohol or drug abuse affecting blood pressure measurement
- Patients unwilling to provide informed consent

Study variables

The independent variables included age, sex, body mass index (BMI), ASA physical status, history of hypertension, and smoking status. The dependent variables were the prevalence of undiagnosed hypertension and its subtypes, namely white coat hypertension and coincidental hypertension.

Operational definitions

Hypertension was defined as office systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg. White coat hypertension was defined as elevated office blood pressure (≥140/90 mmHg) with normal out-of-office blood pressure in previously untreated individuals. Coincidental hypertension referred to previously undiagnosed sustained hypertension (≥140/90 mmHg) detected during preoperative assessment.

Data collection tool

Data were collected using a structured preformed data sheet containing relevant demographic and clinical variables.

Data collection procedure

Participants were selected through purposive sampling at the preoperative assessment unit. After obtaining written informed consent, demographic and clinical data were recorded, and blood pressure was measured as part of routine preoperative evaluation.

Patients were categorized into diagnosed hypertensive, normotensive, and undiagnosed hypertensive groups based on blood pressure readings and medical history. Patients with known hypertension or on antihypertensive therapy were classified as diagnosed hypertensive and excluded from subtype analysis. Those identified as undiagnosed hypertensive were further evaluated and classified into white coat hypertension and coincidental hypertension based on repeated blood pressure measurements during preoperative assessment and follow-up until the pre-induction stage.

Data analysis

Data were analyzed using SPSS version 27.0. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequency and percentage. Comparisons between groups were performed using chi-square test, unpaired t-test, and ANOVA where appropriate. A p-value <0.05 was considered statistically significant.

Ethical considerations

Ethical approval was obtained from the Institutional Review Board of BMU. Written informed consent was obtained from all participants. Confidentiality was strictly maintained, and participants were informed of their right to withdraw from the study at any time without affecting their treatment.

Confidentiality

Participant confidentiality was ensured using unique identification codes. All data were stored securely in password-protected files accessible only to the research team.

RESULTS

A total of 2,084 adult patients undergoing elective surgery were included in the study. The mean age of the cohort was 41.19 ± 15.35 years (range 18–92). Overall hypertension status on preoperative assessment was: hypertensive 445/2,084 (21.4%), normotensive 1,561/2,084 (74.9%), and previously undiagnosed hypertension detected during assessment 78/2,084 (3.7%). Among patients without a prior diagnosis of hypertension (n = 1,639), 78 (4.8%) were identified with undiagnosed hypertension; of these, 26 (33.3%) were classified as white coat hypertension (WCH) and 52 (66.7%) as coincidental hypertensions (CH).

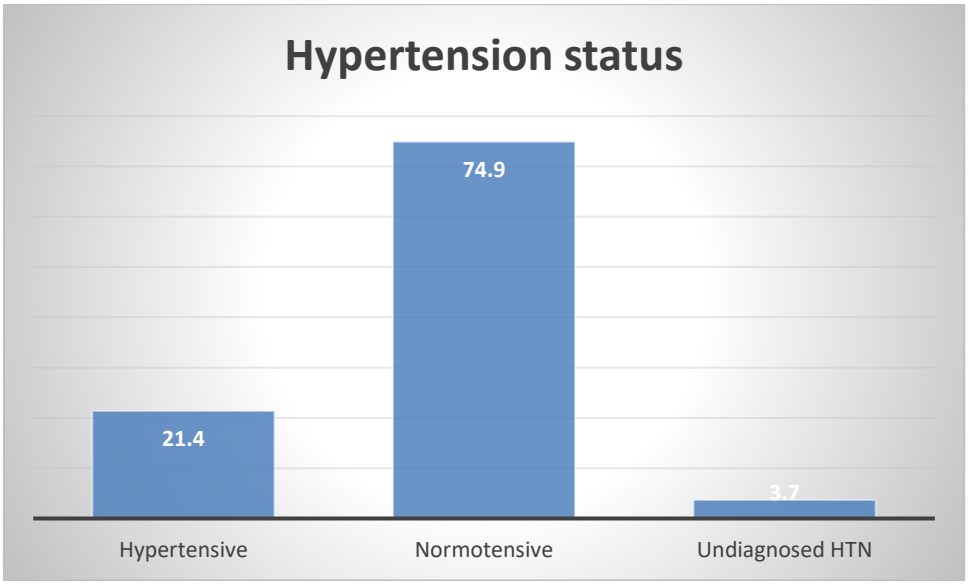

Figure 1 Distribution of Hypertension Status Among Adult Patients Undergoing Elective Surgery (*n* = 2084).

Figure 1 illustrates the distribution of hypertension status among the study participants. Of the 2,084 adult patients undergoing elective surgery, 445 (21.4%) were hypertensive, 1,561 (74.9%) were normotensive, and 78 (3.7%) were

identified with undiagnosed hypertension during preoperative assessment.

Table I presents the sociodemographic characteristics of the study participants. Among the 2,084 patients included in the study, the mean age was 41.19 ± 15.35 years (range: 18–92 years). The largest age group was 18–30 years, comprising 643 (30.9%) participants, followed by 31–40 years with 464 (22.3%) participants and 41–50 years with 392 (18.8%) participants. Patients aged 51–60 years, 61–70 years, and >70 years accounted for 349 (16.7%), 181 (8.7%), and 55 (2.6%) participants, respectively. The study population included 1,053 (50.5%) males and 1,031 (49.5%) females.

Table I
Sociodemographic Characteristics of the Study Participants (*n* = 2084).

Variable		Frequency (n)	Percentage (%)
Age (years)	18–30	643	30.9
	31–40	464	22.3
	41–50	392	18.8
	51–60	349	16.7
	61–70	181	8.7
	>70	55	2.6
	Mean ± SD (Range)	41.19 ± 15.35 (18–92)	
Gender	Male	1053	50.5
	Female	1031	49.5
	Total	2084	100.0

Table II compares the age and gender distribution according to hypertension status. The mean age differed significantly among the three groups ($p < 0.001$), with the highest mean age observed among hypertensive patients (54.81 ± 11.88 years), followed by patients with undiagnosed hypertension (49.00 ± 12.28 years) and normotensive patients (36.93 ± 13.88 years). Hypertensive patients were predominantly aged 51–60 years (146, 32.9%), whereas the majority of normotensive patients belonged to the 18–30 years age group (633, 40.6%). Among patients with undiagnosed hypertension, the highest proportion was observed in the 31–40 years age group (22, 28.2%). Gender distribution also differed significantly among the three groups ($p = 0.013$), with males accounting for 49 (62.8%) of patients with undiagnosed hypertension compared with 29 (37.2%) females.

Table II
Age and Gender Distribution According to Hypertension Status.

Characteristic	Hypertensive (n = 445)	Normotensive (n = 1561)	Undiagnosed HTN (n = 78)	P value
Age group, n (%)				<0.001
18–30 years	7 (1.6)	633 (40.6)	3 (3.8)	
31–40 years	55 (12.4)	386 (24.7)	22 (28.2)	
41–50 years	104 (23.4)	267 (17.1)	21 (26.9)	
51–60 years	146 (32.9)	183 (11.7)	20 (25.6)	
61–70 years	95 (21.4)	78 (5.0)	8 (10.3)	
>70 years	37 (8.3)	14 (0.9)	4 (5.1)	
Mean age (years), Mean ± SD	54.81 ± 11.88	36.93 ± 13.88	49.00 ± 12.28	<0.001
Gender, n (%)				0.013
Male	204 (45.9)	799 (51.2)	49 (62.8)	
Female	240 (54.1)	762 (48.8)	29 (37.2)	

Table III presents the prevalence and subtypes of undiagnosed hypertension among patients without a previous diagnosis of hypertension. Of the 1,639 patients evaluated, 1,561 (95.2%) were normotensive, whereas 78 (4.8%) were identified with undiagnosed hypertension during preoperative assessment. Among the 78 patients with undiagnosed hypertension, 26 (33.3%) had white coat hypertension and 52 (66.7%) had coincidental hypertension.

Table III
Prevalence and Subtypes of Undiagnosed Hypertension Among Patients Without a Previous Diagnosis of Hypertension (*n* = 1639).

Category	Hypertension Status	Frequency (n)	Percentage (%)
Overall	Normotensive	1,561	95.2
	Undiagnosed hypertension	78	4.8
Subtype of Undiagnosed Hypertension	White coat hypertension	26	33.3*
	Coincidental hypertension	52	66.7*

**Percentages are calculated among patients with undiagnosed hypertension (n = 78).*

Table IV compares demographic, clinical, and perioperative characteristics between WCH and CH patients. CH patients were significantly older than WCH patients (mean age 52.06 vs 42.88 years; $p = 0.001$), and a higher proportion of WCH patients were in the youngest age group (18–30 years; 11.5% vs 0%; $p = 0.040$). Gender distribution did not differ significantly between the groups ($p = 0.740$). CH patients had higher ASA physical status (predominantly ASA II) and significantly more comorbid conditions (67.3% vs 30.8%; $p = 0.002$) compared with WCH patients. Body mass index (BMI) did not

differ significantly between the groups (p = 0.767). A higher proportion of CH patients had their operation canceled (11.5% vs 0%; p = 0.049), indicating a potential perioperative burden associated with coincidental hypertension.

Table IV
Comparison of Demographic, Clinical, and Perioperative Characteristics Between White Coat Hypertension (WCH) and Coincidental Hypertension (CH) Patients (*n* = 78).

Characteristic	WCH (n = 26)	CH (n = 52)	P value
Age			<0.040
18–30 years	3 (11.5)	0 (0.0)	
31–40 years	10 (38.5)	12 (23.1)	
41–50 years	7 (26.9)	14 (26.9)	
51–60 years	5 (19.2)	15 (28.8)	
61–70 years	1 (3.8)	7 (13.5)	
>70 years	0 (0.0)	4 (7.7)	
Mean age (years)	42.88 ± 20.73	52.06 ± 11.94	0.001
Gender, n (%)			0.740
Male	17 (65.4)	32 (61.5)	
Female	9 (34.6)	20 (38.5)	
ASA Physical Status, n (%)			<0.007
ASA I	18 (69.2)	17 (32.7)	
ASA II	8 (30.8)	33 (63.5)	
ASA III	0 (0.0)	2 (3.8)	
Comorbidity, n (%)			0.002
Yes	8 (30.8)	35 (67.3)	
No	18 (69.2)	17 (32.7)	
Smoking, n (%)			0.087
Yes	3 (11.5)	15 (28.8)	
No	23 (88.5)	37 (71.2)	
BMI, n (%)			0.688
Underweight (<18.5)	0 (0.0)	3 (5.8)	
Normal weight (18.5–24.9)	14 (53.8)	24 (46.2)	
Overweight (25–29.9)	10 (38.5)	18 (34.6)	
Obese (≥30)	2 (7.7)	7 (13.5)	
Mean BMI	25.25 ± 3.26	24.96 ± 4.39	0.767
Surgical outcome, n (%)			0.049
Operation canceled	0 (0.0)	6 (11.5)	
Operation done	26 (100.0)	46 (88.5)	

Table V presents systolic and diastolic blood pressure measurements for WCH and CH patients across multiple follow-up time points. CH patients consistently had higher SBP and DBP values compared with WCH patients at all time points. For example, baseline SBP was 126.54 ± 3.94 mmHg in WCH versus 142.60 ± 6.44 mmHg in CH, and baseline DBP was 80.19 ± 0.98 mmHg in WCH versus 89.27 ± 5.05 mmHg in CH. Repeated-measures ANOVA demonstrated significant differences between the groups for both SBP and DBP across time points (F = 49.12, p < 0.001 for all comparisons). These findings indicate that coincidental hypertension is associated with higher and more sustained blood pressure elevations compared with white coat hypertension throughout the preoperative and perioperative period.

Table V
Comparison of Systolic and Diastolic Blood Pressure Between White Coat Hypertension (WCH) and Coincidental Hypertension (CH) Patients Across Follow-up Time Points (WCH n = 26; CH n = 52).

Time point	WCH SBP (mmHg)	CH SBP (mmHg)	WCH DBP (mmHg)	CH DBP (mmHg)
BPA	126.54 ± 3.94	142.60 ± 6.44	80.19 ± 0.98	89.27 ± 5.05
CR1	142.69 ± 4.29	151.77 ± 10.07	90.77 ± 2.71	95.10 ± 8.41
CR2	151.77 ± 10.07	143.08 ± 5.30	90.77 ± 2.71	95.10 ± 8.41
CR3	142.88 ± 4.72	151.77 ± 10.07	90.77 ± 2.71	95.10 ± 8.41
APA1	132.50 ± 2.55	150.52 ± 10.32	83.08 ± 2.48	94.27 ± 8.31
APA2	128.08 ± 3.76	144.58 ± 8.49	80.38 ± 1.35	91.15 ± 6.78
APA3	144.23 ± 3.92	148.33 ± 10.17	90.38 ± 2.41	90.38 ± 2.41
F value	49.12	49.12	49.12	49.12
P value	<0.001	<0.001	<0.001	<0.001

BPA = before pre-examination; CR = critical follow-up points; APA = ante/post-anesthetic points; SBP = systolic blood pressure; DBP = diastolic blood pressure.

DISCUSSION

In this cross-sectional study conducted at the Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangladesh Medical University (BMU), a measurable burden of previously undiagnosed hypertension was identified among adult patients undergoing elective surgery during routine preoperative assessment. Hypertension status was significantly associated with increasing age and male sex, while coincidental hypertension was more common than white coat hypertension among patients with newly detected hypertension. These findings highlight the importance of routine preoperative blood pressure screening for the early detection

and appropriate management of previously unrecognized hypertension.

In the present study, among 2,084 adult patients undergoing elective surgery, 21.4% had previously diagnosed hypertension, while 3.7% were identified with previously undiagnosed hypertension during preoperative assessment. These findings are comparable to those reported by Mahdi et al., who found that 21.4% of 41,455 hospitalized adults met the criteria for hypertension, with 5% having hypertension without a prior diagnosis or treatment, demonstrating a similar burden of both known and undiagnosed hypertension across different clinical settings [21]. Likewise, Van der Spuy et al. reported hypertension in 41.9% of 382 adults undergoing elective surgery, including 9.9% with previously undiagnosed hypertension [22]. Although the prevalence of undiagnosed hypertension in the present study was lower, both studies demonstrate that routine preoperative blood pressure assessment is effective in identifying patients with previously unrecognized hypertension. Similar observations were reported by Mengistu et al., who documented an overall prevalence of preoperative hypertension of 6.9% among 423 elective surgical patients and identified previously unrecognized hypertension during perioperative evaluation [23]. Collectively, these findings highlight the importance of routine preoperative blood pressure screening as an opportunity to detect undiagnosed hypertension, allowing timely evaluation and management that may improve both perioperative safety and long-term cardiovascular outcomes.

The present study found that the mean age of the participants was 41.19 ± 15.35 years, with the largest proportion (643, 30.9%) belonging to the 18–30 years age group. The study population comprised 1,053 (50.5%) males and 1,031 (49.5%) females, indicating a nearly equal gender distribution. These findings are comparable to those of Mengistu et al., who reported that the largest age group among 423 elective surgical patients was 20–29 years (36.6%), with a slight male predominance (54.8% males and 45.2% females), reflecting a similar demographic profile of predominantly young adult surgical patients [23]. Likewise, Ige et al. reported a mean age of 42.99 ± 14.92 years among 246 elective surgical patients, which closely resembles the mean age observed in the present study [24]. Furthermore, Sultana et al. noted that most Bangladeshi studies on undiagnosed hypertension recruited adults aged ≥18 years, with study populations largely composed of young- and middle-aged adults, reflecting the demographic profile of the general adult population [25]. The consistency of these demographic characteristics across studies suggests that elective surgical cohorts and populations evaluated for undiagnosed hypertension are predominantly composed of young- to middle-aged adults with a relatively balanced gender distribution, supporting the representativeness of the present study population.

Age and gender were significantly associated with hypertension status in the present study. The mean age was highest among hypertensive patients (54.81 ± 11.88 years), followed by those with undiagnosed hypertension (49.00 ± 12.28 years), whereas normotensive patients had the lowest mean age (36.93 ± 13.88 years) ($p < 0.001$). Hypertensive patients were predominantly aged 51–60 years (32.9%), while the highest proportions of patients with undiagnosed hypertension were observed in the 31–40 years (28.2%) and 41–50 years (26.9%) age groups. In addition, males constituted a greater proportion of patients with undiagnosed hypertension (62.8%) than females (37.2%). These findings are consistent with those of Hossain et al., who reported that the prevalence of undiagnosed hypertension increased steadily with advancing age and was more common among males than females, particularly after 50 years of age [26]. Similarly, Ahmed et al. found that approximately two-thirds of patients with undiagnosed hypertension were aged 35–49 years and that males had a higher prevalence of undiagnosed hypertension than females, closely resembling the age distribution and male predominance observed in the present study [27]. Kumar Roy et al. likewise demonstrated that men consistently carried a higher burden of undiagnosed hypertension than women across different socioeconomic groups [28]. Comparable findings have also been reported in surgical populations. Cheng et al. identified older age as an independent predictor of preoperative blood pressure abnormalities among adults undergoing elective surgery [29], while Venkatesan et al., in a large cohort of elective non-cardiac surgical patients, demonstrated that advancing age significantly influenced the relationship between preoperative blood pressure and perioperative outcomes [30]. Taken together, these findings reinforce the observation that increasing age and male sex are important factors associated with hypertension and undiagnosed hypertension among patients undergoing elective surgery.

Among the 1,639 patients without a previous diagnosis of hypertension in the present study, 78 (4.8%) were identified with undiagnosed hypertension during preoperative assessment, while 1,561 (95.2%) were normotensive. Of the patients with undiagnosed hypertension, 26 (33.3%) had white coat hypertension and 52 (66.7%) had coincidental hypertension. These findings are consistent with those of Drummond et al., who demonstrated that a substantial proportion of patients with elevated preoperative blood pressure had white-coat hypertension, indicating that many newly detected cases in the perioperative setting represent transient clinic-related blood pressure elevation rather than sustained hypertension [31]. Similarly, Manning et al. reported that 23% of patients with elevated clinic blood pressure had white-coat hypertension, emphasizing the importance of distinguishing true hypertension from white-coat hypertension through ambulatory or repeated blood pressure measurements [32]. The relatively higher proportion of white coat hypertension observed in the present study further supports the need for confirmatory blood pressure assessment before establishing a diagnosis of hypertension. At the same time, the predominance of coincidental hypertension (66.7%) underscores the value of routine preoperative screening in identifying patients with previously unrecognized sustained hypertension who may benefit from timely evaluation, treatment, and long-term cardiovascular risk reduction.

LIMITATIONS

This study had several limitations:

- Blood pressure measurements were obtained by different healthcare providers using different blood pressure measuring devices, which may have introduced inter-observer and inter-device variability in the recorded blood pressure values.
- Only patients identified with undiagnosed hypertension during the preoperative assessment underwent further evaluation. Normotensive patients were not followed until the pre-induction stage; therefore, those who may have subsequently developed white coat hypertension were not identified or included in the analysis.

CONCLUSION

Undiagnosed hypertension represents a clinically important but often overlooked problem among adults undergoing elective surgery. A considerable proportion of patients were found to have previously unrecognized hypertension during preoperative assessment, with coincidental hypertension being more common than white coat hypertension. Increasing age and male sex were significantly associated with hypertension status. These findings highlight the importance of routine preoperative blood pressure screening for the early detection of undiagnosed hypertension, enabling timely evaluation and management to improve perioperative safety and long-term cardiovascular outcomes.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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