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Research Article

# Diagnostic Value of Ambulatory Blood Pressure Monitoring for Hypertension in Private Cardiology Practice in Senegal

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## Abstract

Hypertension is a major contributor to cardiovascular morbidity and mortality. Ambulatory blood pressure monitoring (ABPM) complements office blood pressure measurement by detecting white-coat hypertension, masked hypertension, and nocturnal blood pressure abnormalities, and this study aimed to assess its diagnostic value in the management of hypertension in private cardiology practice in Senegal. A prospective, descriptive, and analytical study was conducted from July to September 2024 at Clinique Urgence Cardio in Dakar, including patients aged 18 years or older with a valid 24-hour ABPM recording. Clinical, anthropometric, and treatment data, together with cardiovascular risk factors, were collected; office and ambulatory blood pressure measurements were compared; and logistic regression was used to identify factors associated with discordance between the two methods. Of the 104 patients assessed, 97 had valid ABPM recordings. The mean age was 53.2 ±14.1 years, and women predominated. Cardiovascular risk factors included abdominal obesity (77.3%), known hypertension (54.6%), physical inactivity (43.3%), dyslipidemia (37.1%), and diabetes (16.5%). Mean office blood pressure was 145.7/91.4 mmHg, compared with 130.5/80.2 mmHg over 24 hours, 134.4/82.4 mmHg during daytime, and 125/75 mmHg during nighttime. ABPM identified sustained hypertension in 53.61% of patients, white-coat hypertension in 18.56%, masked hypertension in 9.28%, and normotension in 18.56%, with overall agreement between office and ambulatory measurements of 72.2%. Among patients with elevated office blood pressure, 25.7% had white-coat hypertension, while 33.3% of those with normal office blood pressure had masked hypertension. Non-dipping and reverse-dipping patterns were observed in 45.4% and 19.6% of patients, respectively, and discordance was independently associated with alcohol consumption (OR = 5.08; p = 0.007). ABPM improves the diagnostic classification of hypertension and reveals a high prevalence of discordant phenotypes and nocturnal blood pressure abnormalities, and wider use of ABPM may help optimize patient management in this setting.

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## Keywords

Ambulatory Blood Pressure Monitoring, Hypertension, White-Coat Hypertension, Masked Hypertension, Nocturnal Blood Pressure, Senegal

## 1. Introduction

Hypertension remains one of the leading preventable determinants of cardiovascular morbidity and mortality worldwide. Despite the availability of simple diagnostic tools and effective treatments, hypertension screening, diagnostic confirmation, and control remain inadequate, particularly in low- and middle-income countries [1-3]. Recent estimates from the World Health Organization highlight the magnitude of the problem: approximately one in three adults aged 30-79 years has hypertension, and a substantial proportion of individuals with hypertension remain unaware of their condition [4]. This situation is particularly concerning in sub-Saharan Africa, where rapid urbanization, nutritional transition, physical inactivity, obesity, and unequal access to specialised healthcare contribute to the growing cardiovascular risk [5-8].

In routine clinical practice, the diagnosis of hypertension still relies largely on office blood pressure measurement. However, isolated office measurement has several limitations, including spontaneous blood pressure variability, the white-coat effect, suboptimal measurement conditions, the lack of nighttime blood pressure data, and the inability to identify certain cases of masked hypertension [9, 10]. Twenty-four-hour ambulatory blood pressure monitoring (ABPM) overcomes some of these limitations by providing a dynamic assessment of blood pressure during daytime, nighttime, and throughout the entire 24-hour period [11, 12]. It also enables the assessment of blood pressure load, pulse pressure, and circadian patterns, including dipper, non-dipper, and reverse-dipper patterns, which have recognized prognostic value [13, 14].

In Senegal, data on the use of ABPM in private cardiology practice remain limited. However, this healthcare setting serves a population increasingly exposed to cardiovascular risk factors, with hypertension assessment representing a frequent reason for consultation. Therefore, this study sought to determine the contribution of ABPM to the diagnostic classification of hypertension, compared with office blood pressure measurement, among patients attending private cardiology consultations in Senegal.

The primary objective was to assess the diagnostic value of ABPM in the management of hypertension in private cardiology practice. The specific objectives were to describe the sociodemographic and cardiovascular characteristics of the patients, compare office and ambulatory blood pressure values, identify the blood pressure phenotypes detected by ABPM, and investigate factors associated with discordance between office and ambulatory measurements.

## 2. Methods

This prospective, descriptive, and analytical study was conducted at Clinique Urgence Cardio, a private cardiology clinic in Dakar, Senegal. The study was carried out over a three-month period, from July to September 2024. It included adult patients referred to or seen at the clinic who underwent ambulatory blood pressure monitoring (ABPM) for the diagnosis, assessment, or follow-up of hypertension.

Patients were eligible if they were aged 18 years or older, provided free and informed consent, and had a valid ABPM recording. Pregnant women, patients who did not provide consent, and those with invalid or insufficient ABPM recordings were excluded from the analysis.

Data were collected using a standardized case report form. The variables examined included sociodemographic characteristics, personal and family history of cardiovascular disease, cardiovascular risk factors, clinical findings, anthropometric parameters, current treatments, and ABPM measurements.

Office blood pressure was measured while the patient was at rest. Office hypertension was defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg. Twenty-four-hour ABPM was performed using a non-invasive device while patients engaged in their usual daily activities. The thresholds used for interpretation were those commonly recommended by international guidelines: a 24-hour mean blood pressure ≥130/80 mmHg, a daytime mean ≥135/85 mmHg, and a nighttime mean ≥120/70 mmHg.

Blood pressure phenotypes were classified into four categories. Sustained hypertension was defined as elevated office blood pressure confirmed by ABPM. White-coat hypertension was defined as elevated office blood pressure with normal ABPM values. Masked hypertension was defined as normal office blood pressure with elevated ABPM values. Normotension was defined as normal blood pressure both in the office and on ABPM. Circadian blood pressure patterns were also assessed according to the degree of nocturnal blood pressure reduction and classified as dipper, non-dipper, riser, or extreme dipper.

Data were entered into Microsoft Excel and subsequently analyzed using Stata software. Quantitative variables were summarized using the mean, standard deviation, median, and range. Categorical variables were expressed as frequencies and percentages. Between-group comparisons were performed using appropriate statistical tests, including the chi-square test to assess associations between categorical variables. A p-value <0.05 was considered statistically significant.

Discordance was defined as disagreement between the office and ambulatory classification of hypertension, corresponding to a white-coat or masked hypertension phenotype, whereas concordance corresponded to sustained hypertension or normotension identified by both methods. Binary logistic regression was performed to identify factors associated with this discordance. Candidate variables were first examined in bivariate analyses, and those associated with discordance at a threshold of $p < 0.20$ were entered into the multivariable model. Given the limited number of discordant cases, the number of covariates was deliberately kept small to reduce the risk of model overfitting.

The study was conducted in accordance with the ethical principles applicable to observational clinical research. Informed consent was obtained from all participants, data confidentiality was maintained, and all analyses were performed using an anonymized database.

## 3. Results

During the study period, 104 patients underwent ABPM. Seven recordings were excluded because of non-compliance or insufficient data, leaving 97 patients with valid ABPM recordings for the final analysis (Figure 1). The mean age was 53.20 ± 14.13 years (range: 22-81 years). The most represented age group was 40-49 years, followed by the 50-59- and 60-69-year age groups. Patients aged 50 years or older accounted for a substantial proportion of the study population. Women predominated, with a male-to-female sex ratio of 0.51. Most participants had a middle or high socioeconomic status and access to specialized private healthcare.

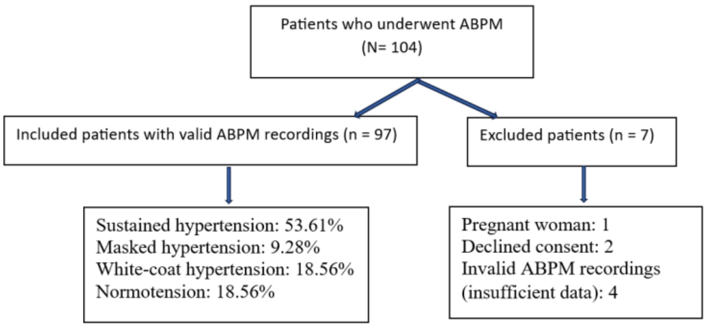


***Figure 1.*** *Study flow diagram.*

Cardiovascular risk factors were common and were dominated by abdominal obesity (77.3%), with a marked female predominance, followed by hypertension (54.6%), physical inactivity (43.3%), dyslipidemia (37.1%), and diabetes mellitus (16.5%). Active smoking was uncommon (Figure 2).

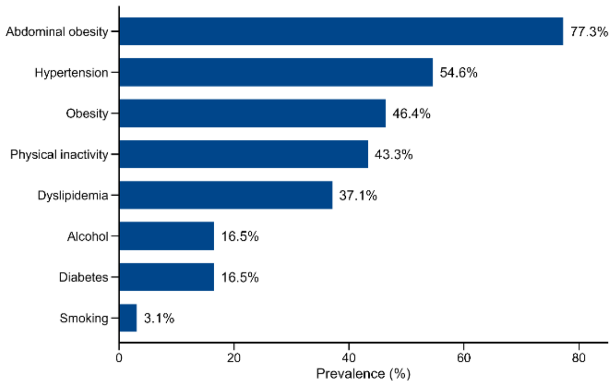


***Figure 2.*** *Distribution of patients according to cardiovascular risk factors (n = 97).*

The main indications for ABPM were the assessment of hypertension (38.1%) and hypertensive episodes. Office blood pressure measurements showed grade 1 hypertension in 42.3% of patients, grade 2 hypertension in 21.7%, and grade 3 hypertension in 8.3% (Figure 3). Mean office systolic and diastolic blood pressures were 145.7 ± 20.7 mmHg and 91.4 ± 15.5 mmHg, respectively. Ambulatory blood pressure values were lower. Mean 24-hour systolic and diastolic blood pressures were 130.5 ± 16.7 mmHg and 80.2 ± 12.2 mmHg, respectively. During daytime, the corresponding values were 134.4 ± 17.1 mmHg and 82.4 ± 12.6 mmHg, whereas nighttime values were 125.0 ± 18.3 mmHg and 75.0 ± 13.1 mmHg, respectively.

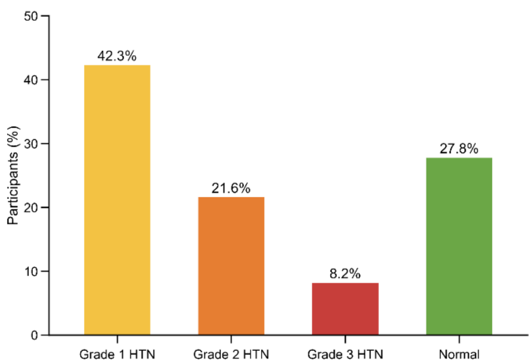


***Figure 3.*** *Distribution of patients by office blood pressure category (n = 97).*

Analysis of blood pressure load revealed a high prevalence of abnormalities, particularly during nighttime. During daytime, 45.4% of patients had a normal blood pressure load, whereas 30.9% had daytime systolic-diastolic hypertension. At night, only 28.9% had a normal blood pressure load, while 48.5% had nighttime systolic-diastolic hypertension. The mean systolic blood pressure load was 42.6% during daytime and 56.2% during nighttime, highlighting the substantial burden of nocturnal hypertension in this population.

Sustained hypertension was the most frequent phenotype, occurring in 53.61% of patients. White-coat hypertension and masked hypertension were observed in 18.56% and 9.28% of patients, respectively (Figure 1).

Overall concordance between office blood pressure measurements and ABPM findings was 72.2%, corresponding to a discordance rate of 27.8% accounted for by the white-coat and masked hypertension phenotypes. Among patients with office hypertension, 74.3% had sustained hypertension confirmed by ABPM, whereas 25.7% had white-coat hypertension. Among patients without office hypertension, 66.7% were normotensive on ABPM, while 33.3% had masked hypertension.

Analysis of circadian blood pressure patterns showed that 45.4% of patients were non-dippers, 34.0% were dippers, and 19.6% were risers. One patient exhibited an extreme-dipper pattern (Figure 4). Circadian blood pressure abnormalities were significantly associated with age, with non-dipper and riser patterns occurring more frequently among patients aged 50 years or older (Table 1).

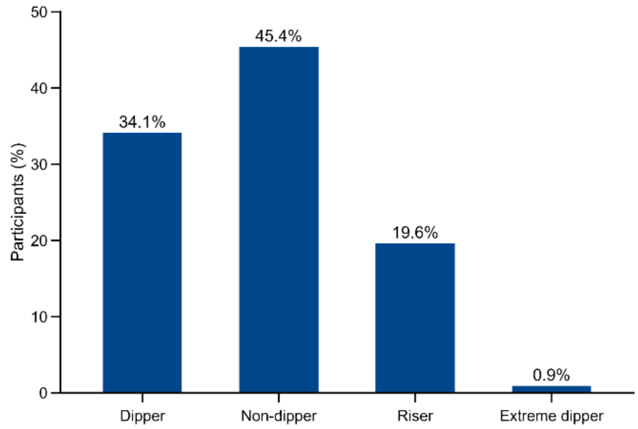


***Figure 4.*** *Distribution of patients according to nocturnal blood pressure dipping pattern (n = 97).*

***Table 1.*** *Association between circadian blood pressure patterns and cardiovascular risk factors (n = 97).*

| Circadian rhythm | Categories | Dipper | Non-dipper | Riser | Extreme dipper | Total | P-value |
|---|---|---|---|---|---|---|---|
| Age | <50 years | 51.2 | 34.2 | 14.6 | 0.0 | 100 | 0.021 |
| | ≥50 years | 21.4 | 53.6 | 23.2 | 1.8 | 100 | |
| Sex | Female | 31.3 | 48.4 | 20.3 | 0.0 | 100 | 0.422 |
| | Male | 39.4 | 39.4 | 18.2 | 3.0 | 100 | |
| Smoking | Yes | 0.0 | 33.3 | 66.7 | 0.0 | 100 | |
| | No | 32.9 | 45.9 | 20.0 | 1.2 | 100 | 0.262 |
| | Former | 55.6 | 44.4 | 0.0 | 0.0 | 100 | |
| Alcohol | Yes | 18.8 | 50.0 | 3.3 | 0.0 | 100 | 0.402 |
| | No | 37.0 | 44.4 | 17.3 | 1.2 | 100 | |
| Physical inactivity | Yes | 42.9 | 40.5 | 14.3 | 2.4 | 100 | 0.216 |
| | No | 27.3 | 49.1 | 23.6 | 0.0 | 100 | |
| Diabetes | Yes | 31.25 | 50 | 18.75 | 0 | 100 | 0.953 |
| | No | 34.57 | 44.44 | 19.75 | 1.23 | 100 | |
| BMI | Thinness | 0 | 100 | 0 | 0 | 100 | 0.734 |
| | Normal | 30.43 | 43.48 | 26.09 | 0 | 100 | |
| | Overweight | | 42.22 | 13.33 | 2.22 | 100 | |
| | Obesity | 25 | 50 | 25 | 0 | 100 | |
| Abdominal Obesity | Yes | 34.67 | 46.67 | 17.33 | 1.33 | 100 | 0.725 |
| | No | 31.82 | 40.91 | 27.27 | 0 | 100 | |

Daytime blood pressure load was significantly associated with age and smoking status (Table 2). Nighttime blood pressure load was significantly associated with age, while borderline associations were observed with alcohol consumption and obesity (Table 3). The overall blood pressure phenotype was strongly associated with alcohol consumption, with a high proportion of masked hypertension among patients who consumed alcohol.

***Table 2.*** *Association between nighttime blood pressure load and cardiovascular risk factors (n = 97).*

| Overall nighttime load | Categories | Diastolic hypertension | Systolic hypertension | Systolo-diastolic hypertension | Normal | Total | P-value |
|---|---|---|---|---|---|---|---|
| Age | <50 years | 17.1 | 0.0 | 48.8 | 34.2 | 100 | 0.013 |
| | ≥50 years | 7.1 | 19.6 | 48.2 | 25.0 | 100 | |
| Sex | Female | 10.9 | 10.9 | 48.4 | 29.7 | 100 | 0.992 |
| | Male | 12.1 | 12.1 | 48.5 | 27.3 | 100 | |
| Smoking | Yes | 0.0 | 33.3 | 66.7 | 0.0 | 100 | |
| | No | 9.4 | 9.4 | 50.6 | 30.6 | 100 | 0.142 |
| | Former | 33.3 | 22.2 | 22.2 | 22.2 | 100 | |
| Alcohol | Yes | 0.0 | 12.5 | 75.0 | 12.5 | 100 | 0.08 |
| | no | 13.6 | 11.1 | 43.2 | 32.1 | 100 | |
| Physical inactivity | Yes | 11.9 | 4.8 | 57.1 | 26.2 | 100 | 0.242 |
| | No | 10.9 | 16.4 | 41.8 | 30.9 | 100 | |
| Diabetes | Yes | 6.25 | 25 | 50 | 18.75 | 100 | 0.233 |
| | No | 12.35 | 8.64 | 48.15 | 30.86 | 100 | |
| | Thinness | 0 | 100 | 0 | 0 | 100 | |
| | Normal | 8.7 | 17.39 | 47.83 | 26.09 | 100 | |
| BMI | | | | | | | 0.083 |
| | Overweight | 15.56 | 6.67 | 40 | 37.78 | 100 | |
| | Obesity | 7.14 | 10.71 | 64.29 | 17.86 | 100 | |
| Abdominal obesity | Yes | 12 | 12 | 49.33 | 26.67 | 100 | 0.835 |
| | No | 9.09 | 9.09 | 45.45 | 36.36 | 100 | |

***Table 3.*** *Association between daytime blood pressure load and cardiovascular risk factors (n = 97).*

| Daily total load | Categories | Systolic hypertension | Diastolic hypertension | Systolic-diastolic hypertension | Normal | Total | P-value |
|---|---|---|---|---|---|---|---|
| Age | <50 years | 17.1 | 2.4 | 34.2 | 46.3 | 100 | 0.047 |
| | ≥50 years | 7.1 | 19.6 | 28.6 | 44.6 | 100 | |
| Sex | Female | 9.4 | 12.5 | 28.1 | 50.0 | 100 | 0.57 |
| | Male | 15.2 | 12.1 | 36.4 | 36.4 | 100 | |
| Smoking | Yes | 0.0 | 66.7 | 33.3 | 0.0 | 100 | |
| | No | 10.6 | 11.8 | 32.9 | 44.7 | 100 | 0.041 |
| | Former | 22.2 | 0.0 | 11.1 | 66.7 | 100 | |

| Daily total load | Categories | Systolic hypertension | Diastolic hypertension | Systolic-diastolic hypertension | Normal | Total | P-value |
|---|---|---|---|---|---|---|---|
| Alcohol | Yes | 12.5 | 31.3 | 25.0 | 31.3 | 100 | 0.086 |
| | No | 11.1 | 8.6 | 32.1 | 48.2 | 100 | |
| Physical inactivity | Yes | 14.3 | 9.5 | 33.3 | 42.9 | 100 | 0.731 |
| | No | 9.1 | 14.6 | 29.1 | 47.3 | 100 | |
| Diabetes | Yes | 0 | 6.25 | 37.5 | 56.5 | 100 | 0.318 |
| | No | 13.58 | 13.58 | 29.63 | 43.1 | 100 | |
| BMI | Thinness | 0 | 0 | 0 | 100 | 100 | 0.398 |
| | Normal | 8.7 | 8.7 | 26.09 | 56.52 | | |
| | Overweight | 13.33 | 6.67 | 31.11 | 48.89 | | |
| | Obesity | 10.71 | 25 | 35.71 | 28.57 | | |
| Abdominal Obesity | Yes | 10.67 | 14.67 | 32 | 42.67 | 100 | 0.533 |
| | No | 13.64 | 4.55 | 27.27 | 54.55 | 100 | |

In the logistic regression model, discordance between office blood pressure measurements and ABPM findings was significantly associated with alcohol consumption (odds ratio: 5.08; p = 0.007). Age, sex, and dyslipidemia were not significantly associated with discordance after adjustment (Table 4).

***Table 4**. Multivariable analysis of factors associated with discordance between ABPM and office blood pressure measurements.*

| Discordance (Clinical vs ABPM) | Coefficient | Odd-Ratio | Standard error | P>z |
|---|---|---|---|---|
| Age | 0.028 | 1.03 | 0.018 | 0.124 |
| Sex-Male | -0.559 | 0.57 | 0.538 | 0.299 |
| Alcohol | 1.626 | 5.08 | 0.607 | 0.007 |
| Dyslipidemia | -0.709 | 0.49 | 0.545 | 0.193 |

## 4. Discussion

This study highlights the major value of ambulatory blood pressure monitoring in diagnosing hypertension in a private cardiology practice in Senegal. The study population was relatively young, with a mean age of 53.2 years, but already had a high cardiovascular risk burden, as reflected by the high prevalence of known hypertension, abdominal and general obesity, physical inactivity, and dyslipidemia. This profile is consistent with the epidemiological transition occurring in sub-Saharan Africa, where urbanization, dietary changes, and declining physical activity contribute to the growing burden of hypertension [5, 9]. However, the particularly high prevalence of abdominal obesity and physical inactivity observed here should be interpreted in light of the recruitment setting. Because patients were recruited from a private cardiology clinic serving predominantly middle- and high-socioeconomic-status individuals, these frequencies most likely reflect the characteristics of this specific population rather than those of the general Senegalese or wider sub-Saharan African population.

The main finding of this study was the substantial discordance between office and ambulatory blood pressure measurements. Overall concordance was 72.2%, indicating that approximately one in four patients could be misclassified based on office measurements alone. ABPM identified white-coat hypertension in 18.56% of patients and masked hypertension in 9.28%. Both phenotypes have important clinical implications. White-coat hypertension may lead to overdiagnosis and overtreatment, whereas masked hypertension carries the opposite risk of underdiagnosis and undertreatment [11, 15].

These findings are consistent with recent guidelines emphasizing the importance of out-of-office measurements, particularly ABPM and home blood pressure monitoring, to confirm the diagnosis of hypertension and improve cardiovascular risk stratification [9, 11].

The proportion of sustained hypertension observed in our study (53.61%) was similar to that reported by Kaul et al., who found a prevalence of 55.5%. Conversely, it differed from the findings of Chuwa and Chillo, who reported a substantially lower prevalence of sustained hypertension. These differences may be explained by variations in the characteristics of the study populations, particularly age, treatment status, and recruitment setting. Our study included patients with previously diagnosed hypertension and those receiving antihypertensive treatment, thereby logically increasing the likelihood of detecting hypertension confirmed by ABPM [16, 17].

Another important finding was the high prevalence of nocturnal abnormalities. Nighttime blood pressure load was greater than daytime blood pressure load. Non-dippers accounted for 45.4% of patients, while an additional 19.6% exhibited a riser pattern. This finding is clinically relevant because nocturnal hypertension and the absence of a physiological nighttime decline in blood pressure are associated with increased cardiovascular risk, independently of office blood pressure [15, 18]. ABPM therefore provides prognostic information that cannot be obtained from office measurements. In this population, it may help identify patients requiring closer follow-up, assessment for target-organ damage, or adjustment of antihypertensive therapy.

The significant association between office-ABPM discordance and alcohol consumption also warrants attention. In our model, alcohol consumption was associated with an approximately fivefold higher likelihood of discordance. This finding should be interpreted cautiously because of the limited sample size. Nevertheless, it suggests that certain behavioral factors may contribute to greater blood pressure variability or atypical blood pressure patterns. Further investigation is warranted in larger studies incorporating the amount and pattern of alcohol consumption, sleep, stress, and adherence to antihypertensive therapy.

This study has several limitations. It was a single-center study conducted in a private healthcare setting, with a modest sample size and a short recruitment period. Consequently, the sociodemographic profile and cardiovascular risk factor frequencies observed here are unlikely to be representative of the general Senegalese population or of patients managed in public or primary care settings, and these findings should not be generalized to hypertension management in Senegal as a whole. Furthermore, several important prognostic variables, including laboratory, renal, and echocardiographic data and the assessment of sleep apnea, were not systematically collected. Despite these limitations, our findings support a more structured use of ABPM in the diagnostic evaluation of hypertension in comparable private cardiology settings, particularly among patients with suspected white-coat hypertension, masked hypertension, nocturnal hypertension, or apparently uncontrolled blood pressure.

## 5. Conclusion

This study demonstrates that ambulatory blood pressure monitoring provides substantial diagnostic value in the assessment of hypertension in private cardiology practice in Senegal. ABPM identified a high proportion of sustained hypertension, as well as white-coat and masked hypertension phenotypes that would have been misclassified based on office blood pressure measurements alone. It also revealed a high prevalence of nocturnal abnormalities, particularly nocturnal hypertension and non-dipping patterns, highlighting its value beyond diagnostic confirmation.

These findings support a more structured strategy for confirming hypertension, combining standardized office blood pressure measurement, home blood pressure monitoring where available, and ABPM in patients at risk of misclassification. Because this study was limited to a single private cardiology clinic serving a predominantly middle- and high-socioeconomic-status population, these findings should not be extrapolated to hypertension management in Senegal as a whole. Larger multicenter studies conducted across diverse healthcare settings and incorporating laboratory, renal, and echocardiographic data are needed to better determine the prognostic significance of these blood pressure phenotypes in the broader Senegalese population.

## Abbreviations

| | |
|---|---|
| ABPM | Ambulatory Blood Pressure Monitoring |
| BMI | Body Mass Index |
| HTN | Hypertension |
| OR | Odds Ratio |

## Author Contributions

**Ngone Diaba Gaye:** Visualization, Writing – original draft, Writing – review & editing

**Coumba Kaba:** Formal Analysis

**Aliou Alassane Ngaide:** Conceptualization, Formal analysis, Supervision, Writing – original draft, Writing – review & editing

## Conflicts of Interest

The authors declare no conflicts of interest.

## References


[1] Vaduganathan M, Mensah GA, Turco JV, Fuster V, Roth GA. The Global Burden of Cardiovascular Diseases and Risk: A Compass for Future Health. J Am Coll Cardiol. 2022; 80(25): 2361-2371. https://doi.org/10.1016/j.jacc.2022.11.005

[2] Olsen MH, Angell SY, Asma S, et al. A call to action and a lifecourse strategy to address the global burden of raised blood pressure on current and future generations: the Lancet Commission on hypertension. Lancet. 2016; 388(10060): 2665-2712. https://doi.org/10.1016/S0140-6736(16)31134-5

[3] NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. Lancet. 2021; 398(10304): 957-980. https://doi.org/10.1016/S0140-6736(21)01330-1

[4] World Health Organization. Hypertension: fact sheet. Geneva: World Health Organization; 2025. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension

[5] Gafane-Matemane LF, Craig A, Kruger R, et al. Hypertension in sub-Saharan Africa: the current profile, recent advances, gaps, and priorities. Journal of Human Hypertension. 2025; 39(2): 95-110. https://doi.org/10.1038/s41371-024-00913-6

[6] Nel JH, Steyn NP. The nutrition transition and the double burden of malnutrition in sub-Saharan African countries: how do these countries compare with the recommended Lancet Commission global diet? *Int J Environ Res Public Health*. 2022; 19(24): 16791. https://doi.org/10.3390/ijerph192416791

[7] Jobe M, Beye SM, Gaye ND, Ka MM, Perel P, Perkins AD, et al. Hypertension in Sub-Saharan Africa: Burden, Barriers, and Priorities for Improving Treatment Outcomes. *Circulation Research*. 2025; 137: 106-118. https://doi.org/10.1161/CIRCRESAHA.124.323889

[8] Price AJ, Crampin AC, Amberbir A, et al. Prevalence of obesity, hypertension, and diabetes, and cascade of care in sub-Saharan Africa: a cross-sectional, population-based study in urban and rural Malawi. Lancet Diabetes Endocrinol. 2018; 6(3): 208-222. https://doi.org/10.1016/S2213-8587(17)30432-1

[9] McEvoy JW, McCarthy CP, Bruno RM, et al. 2024 ESC Guidelines for the management of elevated blood pressure and hypertension. Eur Heart J. 2024; 45: 3912-4018

[10] Lee EM. When and how to use ambulatory blood pressure monitoring and home blood pressure monitoring for managing hypertension. Clin Hypertens. 2024; 30: 10. https://doi.org/10.1186/s40885-024-00265-w

[11] Mancia G, Kreutz R, Brunström M, et al. 2023 ESH Guidelines for the management of arterial hypertension. J Hypertens. 2023; 41(12): 1874-2071. https://doi.org/10.1097/HJH.0000000000003480

[12] Cepeda M, Pham P, Shimbo D. Status of ambulatory blood pressure monitoring and home blood pressure monitoring for the diagnosis and management of hypertension in the US: an up-to-date review. *Hypertens Res*. 2023; 46(3): 620-629. https://doi.org/10.1038/s41440-022-01137-2

[13] Tang A, Yang E, Ebinger JE. Non-dipping blood pressure or nocturnal hypertension: does one matter more? Current Hypertension Reports. 2024; 26: 21-30. https://doi.org/10.1007/s11906-023-01273-1

[14] Huart J, Persu A, Lengelé JP, et al. Pathophysiology of the non-dipping blood pressure pattern. Hypertension. 2023; 80(4): 719-729. https://doi.org/10.1161/HYPERTENSIONAHA.122.19996

[15] Noubiap JJ, Nansseu JR, Nkeck JR, Nyaga UF, Bigna JJ. Prevalence of white coat and masked hypertension in Africa: a systematic review and meta-analysis. J Clin Hypertens. 2018; 20(8): 1165-1172. https://doi.org/10.1111/jch.13321

[16] Kaul U, Arambam P, Rao S, Kapoor S, Swahney JPS, Sharma K, et al. Usefulness of ambulatory blood pressure measurement for hypertension management in India: the India ABPM study. Journal of Human Hypertension. 2020; 34(6): 457-467. https://doi.org/10.1038/s41371-019-0243-6

[17] Chuwa G, Chillo P. Ambulatory Blood Pressure Profiles and Correlation with Cardiovascular Risk Factors in a Sample of 390 University Employees in Tanzania. Integrated Blood Pressure Control. 2020; 13: 197-208. https://doi.org/10.2147/IBPC.S280763

[18] Krakoff LR. Nocturnal Blood Pressure and Cardiovascular Risk. Hypertension. 2020 Aug; 76(2): 316-317. https://doi.org/10.1161/HYPERTENSIONAHA.120.14409