# Prevalence of cardiovascular risk in hypertensive patients according to their circadian blood pressure rhythm: a single-center observational study.

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## Summary

**Introduction**: Arterial hypertension is regarded as a significant risk factor for developing cardiovascular diseases, which, due to their complications, can result in events associated with high morbidity and mortality. Circadian rhythm patterns contribute to increased cardiovascular risk, which can be detected through ambulatory blood pressure monitoring (ABPM).

**Method**: This study was a retrospective, observational, cross-sectional, and analytical analysis of the clinical histories of 149 patients aged between 50 and 60 years with a prior diagnosis of arterial hypertension. A bivariate analysis of the variables was conducted.

**Results:** The highest prevalence of the No Dipper pattern was 45.64% (68/149), followed by the Dipper pattern at 36.24% (54/149), the Riser pattern at 16.11% (24/149), and the Extreme Dipper pattern at 2.01% (3/149). Similarly, 81.21% (121/149) of participants were smokers, while 8.72% (13/149) exhibited nocturnal HTA. Patients without dippers were the most prevalent, with cardiovascular risks ranging from 5% to 10%.

**Conclusions:** No dipper or riser patterns were more closely related to increased cardiovascular risk, even though risk factors were found in all patterns. Their identification could help monitor and choose the appropriate therapy, identify low-cost tools that can be added to existing tools, and generate a high impact in the future in preventing cardiovascular events.

## Keywords:

Essential hypertension, Circadian rhythm, Cardiovascular risk, Ambulatory blood pressure monitoring, Cardiovascular diseases

## Abbreviations

BMI: Body mass index.
ABPM: Ambulatory blood pressure monitoring.
CVR: Cardiovascular risk.

### Additional information

No supplementary materials are declared.

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### Authors' contributions

**Carlos Andrés Cabezas-Weir**: Conceptualization, investigation, writing—original draft, resources, software, supervision.
**Naya Veruska Maldonado Izurieta**: Conceptualization, investigation, writing – original draft, resources, software, supervision.
**María Elisa Otero Celi:** Methodology, Data curation, Formal analysis, Funding acquisition, Project administration, Validation, Visualization, Writing – review and editing.
All the authors read and approved the final version of the manuscript.

### Financing

The authors funded the expenses of this research.

### Availability of data and materials

The datasets used and analyzed during the present study are available from the corresponding author upon reasonable request.

## Introduction

Arterial hypertension is the most critical factor for the development of cardiovascular diseases. In 2008, 17 million deaths worldwide were caused by cardiovascular diseases. The different social and environmental characteristics of all regions make the prevalence and diagnostic tools differ substantially [1].

This pathology is characterized by a sustained increase in vascular resistance due to the constant vasoconstriction of arterioles, which causes wall hypertrophy. This pathophysiology results in elevated blood pressure without secondary causes. However, many people visit medical services when they present serious cardiovascular complications, which reflects the lack of adherence and follow-up of medical instructions [2]. The increase in the incidence of chronic renal failure has been associated with the increasingly high prevalence of essential arterial hypertension [3]. The WHO considers that the lack of treatment adherence is an important issue related to public health because of all the harmful consequences it has in the long term for the population. Similarly, this lack of adherence generates excellent personal, family and social losses [4].

Blood pressure always follows a circadian pattern that is regularly traced, with higher blood pressure during the day and lower blood pressure during the night. However, in many hypertensive patients, this decrease is not observed during the night when the patient is at rest, the so-called nondipper pattern, which has been associated with a worse prognosis of CVR [5, 6]. This pattern has led to greater attention to nocturnal hypertension, as well as to some sleep disorders that are related to blood pressure. Data were obtained in an adequate, outpatient, noninvasive way via blood pressure measurements taken within 24 hours. The American Heart Association defines nocturnal hypertension as nocturnal blood pressure >125/75 [6]. The dipper pattern is a decrease of between 10% and 20% in nocturnal blood pressure concerning daytime blood pressure; on the other hand, the nondipper pattern has been subdivided into those who show a decrease in blood pressure during the night >0% but <10%. Another type of patient is those referred to as extreme dippers, >20% drop, which is related to many studies with higher CVR and mortality due to nocturnal hypoperfusion and/or exaggerated increases in blood pressure in the early hours of the morning. On the other hand, if blood pressure values exceed the average blood pressure value during wakefulness, this constitutes a riser pattern [6].

The evidence suggests that within the nondipper pattern, the autonomic system, including abnormal parasympathetic and sympathetic system activity, is impaired, which could explain the increased cardiovascular risk. Target organ damage, left ventricular hypertrophy, CVD, microalbuminuria and the progression of renal damage are more significant in patients with this pattern. The population with typical daytime blood pressure values and a nondipper pattern constitutes a special group that may require early treatment, which may be delayed due to its occult nature [7].

Studies have suggested that an abnormal circadian blood pressure profile is closely related to increased CVR in patients who have already experienced AMI. Several studies have been conducted in Spain; however, this relationship has not been proven in patients who have not yet experienced a cardiovascular event. However, it has been possible to demonstrate the relationship between the increase in CVR factors (hypercholesterolemia, dyslipidemia, high BMI, smoking and glycemic disorders) in patients who do not depress nocturnal blood pressure compared with daytime blood pressure [8]. The objective of the present study was to determine the prevalence of cardiovascular risk in hypertensive patients according to their circadian rhythm of blood pressure, with the hypothesis that there is a relationship between cardiovascular risk and the circadian rhythm pattern.

## Materials and methods

### Study design

This study is observational. The source is retrospective.

### Scenery

The study was conducted at the General Hospital of the North of Guayaquil Los Ceibos, located in Guayaquil, Guayas Province, from January 2021 to January 2022.

### Participants

Patients aged 50 to 60 years with a diagnosis of essential arterial hypertension, an ambulatory blood pressure monitoring record with at least 15 correctly recorded readings, and a description of antihypertensive treatment were included. Patients with an additional diagnosis of diabetes mellitus, acute myocardial infarction, hypothyroidism, hyperthyroidism, chronic kidney disease, cerebrovascular events or a history of thrombosis were excluded.

### Variables

The variables used were age, sex, smoking status, cholesterol, body mass index, circadian rhythm pattern, degree of hypertension, antihypertensive treatment, white coat

syndrome, nocturnal arterial hypertension, and GloboRisk cardiovascular risk score.

### Data sources/measurements

The source was indirect: The institutional clinical history data were used to fill out an electronic form. Cardiovascular risk was calculated via the Globorisk scale (http://www.globorisk.org/calc/labform). The institution's cardiology service obtained information on ambulatory blood pressure monitoring.

### Biases

The application of the participant selection criteria avoided observation and selection bias. The principal investigator kept the data via a guide and records approved in the research protocol to prevent interviewer, information, and memory bias. Two researchers independently analyzed each record in duplicate, and the variables were recorded in the database once their concordance was verified.

### Study size

The sample was probabilistic. In a population between 50 and 60 years old in Guayaquil, accounting for 318,644 inhabitants, 19.1% of the population was diagnosed with essential arterial hypertension (60,861 cases). The 8% of the population with probable comorbidity of type 2 diabetes was eliminated, with 55,992 cases as a possible study population. Using EPI info (CDC, Atlanta), with an expected frequency of the MAPA study in the outpatient population of 15%, with a confidence limit of 5% and a confidence level of 90%, the sample size was 138 cases.

### Quantitative variables

Descriptive statistics were used. The results are expressed as frequencies and percentages. The variable Vascular Risk was calculated.

### Statistical analysis

Qualitative variables are presented as frequencies and percentages. Proportions were compared with chi-square tests. The statistical package was IBM Corp.'s IBM SPSS Statistics for Windows, Version 26.0 (released in 2018). Armonk, NY: IBM Corp.

## Results

### Participants

A total of 149 patients were included in the study.

### Main characteristics of the study group

There were 149 cases, 98 of which were women (65.77%). Table 1 presents the general characteristics of the groups according to their distribution and circadian rhythm profile. The prevalence of nocturnal hypertension was more significant in the Dipper group. There were no differences in the general characteristics of the degree of hypertension or the treatment scheme between the groups (Table 1). The largest group was non-DIPPER (45.6%), followed by DIPPER (36.2%) (Figure 1). Among the 149 patients, 10.7% had a record of white coat syndrome, and 8.7% of the patients studied recorded figures corresponding to nocturnal hypertension.

### Cardiovascular risk

Table 2 shows the percentage of cardiovascular risk measured with the Globorisk scale, with the circadian rhythm patterns of the 149 patients studied. The high percentage remains for the 5--10% group and is >10%. When performing the chi-square analysis, there are segmental associations for specific groups of patients for both risk <5% and 5--10%. There was no association with cardiovascular risk >10%. Table 2 presents the post hoc analyses where a protective association with an odds ratio <1 is demonstrated between "Riser" type hypertension and cardiovascular risk less than 5%. Similarly, there was an association of cardiovascular risk >10% with the Riser type of hypertension (Table 3).

**Figure 1.** Descriptive characteristics of the group by type of hypertension.

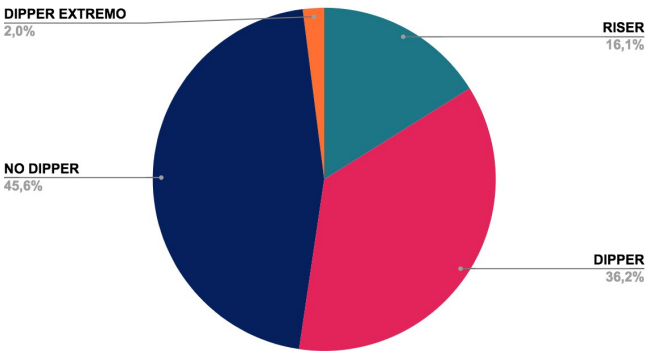

**Table 1.** General characteristics of the study group.

| | Dipper N=57 | No Dipper N=68 | Riser N=24 | P |
|---|---|---|---|---|
| Gender Female | 37 (64.9%) | 44 (64.7%) | 17 (70.8%) | 0.9542 |
| Smoking | 9 (15.8%) | 12 (17.6%) | 7 (29.2%) | 0.4357 |
| Sd . in white coat | 6 (10.5%) | 7 (10.3%) | 3 (12.5%) | 0.9275 |
| Nocturnal hypertension | 1 (33.3%) | 5 (7.4%) | 7 (29.2%) | 0.000298 |
| **Body mass index (kg/m²)** | | | | |
| < 18 | 4 (7.0%) | 3 (4.4%) | 0 | 2.149E-8 |
| 18 – 24.9 | 27 (47.4%) | 35 (51.5%) | 10 (41.7%) | 0.03198 |
| 25 – 29.9 | 22 (38.6%) | 20 (29.4%) | 11 (45.8%) | 0.2929 |
| 30 – 34.9 | 3 (5.3%) | 10 (14.7%) | 3 (12.5%) | 0.2257 |
| 35 – 39.9 | 1 (1.8%) | 0 | 0 | 0.4438 |
| **Cholesterol (mg/dl)** | | | | |
| <200 | 26 (45.6%) | 40 (58.8%) | 13 (54.2%) | 0.335 |
| >240 | 10 (17.5%) | 11 (16.2%) | 6 (25.0%) | 0.6214 |
| 200 - 240 | 21 (36.8%) | 17 (25.0%) | 5 (20.8%) | 0.2214 |
| **Classification of arterial hypertension** | | | | |
| Grade 1 | 8 (14.0%) | 4 (5.9%) | 2 (8.3%) | 0.2924 |
| Grade 2 | 3 (5.3%) | 1 (1.5%) | 3 (12.5%) | 0.08692 |
| Grade 3 | 0 | 1 (1.5%) | 1 (4.2%) | 0.328 |
| Isolated Systolic Hypertension | 9 (15.8%) | 14 (20.6%) | 3 (12.5%) | 0.6119 |
| Normal | 10 (17.5%) | 20 (29.4%) | 8 (33.3%) | 0.1997 |
| Normal High | 13 (22.8%) | 13 (19.1%) | 3 (12.5%) | 0.5615 |
| Optimal | 14 (24.6%) | 15 (22.1%) | 4 (16.7%) | 0.7367 |
| **Treatment regimen** | | | | |
| Monotherapy | 18 (31.6%) | 26 (38.2%) | 9 (37.5%) | 0.724 |
| Double Therapy | 27 (47.4%) | 18 (26.5%) | 8 (33.3%) | 0.05051 |
| Triple Therapy | 10 (17.5%) | 16 (23.5%) | 5 (20.8%) | 0.7138 |
| Quadruple Therapy | 1 (1.8%) | 7 (10.3%) | 2 (8.3%) | 0.1547 |
| Quintuple Therapy | 1 (1.8%) | 1 (1.5%) | 0 | 0.8154 |

**Table 2.** Association of Cardiovascular Risk and Type of Hypertension.

| | Dipper N=57 | No Dipper N=68 | Riser N=24 | *P* |
|---|---|---|---|---|
| **Cardiovascular Risk % Globorisk** | | | | |
| < 5 | 26 (45.6%) | 31 (45.6%) | 3 (12.5%) | 0.0102 |
| 5 to 10 | 22 (38.6%) | 31 (45.6%) | 16 (66.7%) | 0.06794 |
| > 10 | 9 (15.8%) | 6 (8.8%) | 5 (20.8%) | 0.2663 |

**Table 3. Odds Ratio**

| | Dipper N=57 | No Dipper N=68 | Riser N=24 |
|---|---|---|---|
| **Cardiovascular Risk % Globorisk** | | | |
| **< 5** | OR: 1.4307<br>95% CI: 0.731-2.80<br>P=0.2958 | OR: 1.5023<br>95% CI: 0.78-2.90<br>P=0.2260 | **OR: 0.1704**<br>**95%CI: 0.0483-0.6008**<br>**P=0.0059** |
| **5 to 10** | OR: 0.6018<br>95%CI: 0.307-1.178<br>P=0.1385 | OR: 0.9481<br>95%CI:0.497- 1.810<br>P=0.8716 | **OR: 2.7170**<br>**95%CI:1.0829-6.8167. P=0.0332** |
| **> 10** | OR: 1.3807<br>95%CI: 0.534-3.572<br>P=0.5060 | OR: 0.4631<br>95%CI: 0.168 - 1.28<br>P=0.1379 | OR: 1.9298<br>95% CI: 0.628-5.93<br>*P* =0.2513 |

OR: Odds ratio. 95% CI: 95% confidence interval.

# Discussion

Arterial hypertension is a risk factor that leads to cardiovascular diseases, such as white coat hypertension, which can be assessed with ambulatory blood pressure monitoring values [8].

Blood pressure obtained via ABPM is better related to target organ damage and increased cardiovascular morbidity and mortality. Masked arterial hypertension has a prognosis similar to that of sustained arterial hypertension.

Many studies mentioned below agree that many patients have a circadian rhythm profile in which an adequate decrease in blood pressure, especially at night, is not observed.

Fifty-three percent of these hypertensive patients do not have this adequate decrease, and most of them are under hypertensive treatment [8].

In the Ohasama study with Japanese people aged 40 years or older, 44% of the participants were nonnocturnal depressants. In this study, in Madrid, no differences were found in the circadian pattern between patients treated with antihypertensive drugs and those not treated with antihypertensive medications because of the different pharmacological combinations used at other times of the day [9].

In the present study, the presence of cardiovascular risk factors in patients with no nocturnal blood pressure depressors was related. This demonstrates an increase in these factors, such as hypercholesterolemia, dyslipidemia, and high body mass index. A study conducted by OBrien revealed that nondipper patients were associated with female sex and reduced renal function, and it is common to find a history of previous cardiovascular events; however, those patients with nocturnal hypertension but with an expected decrease in blood pressure were more likely to be male patients, smokers and have increased urinary albumin elimination [10]. Another study revealed that in nondipper patients, diabetes, metabolic syndrome, obstructive sleep apnea, anemia, and significant kidney damage are more common [11]. Shimada and Kario reported that the increase in blood pressure upon awakening and/or a decrease in the drop in blood pressure is associated with an increase in CV risk or organic damage, especially at the cardiac level, LVH, CHF and AMI; at the cerebral level, cerebrovascular events occur every day; and at the renal level, renal damage, along with albuminuria, progresses [11].

Changes during the sleep–wake cycle determine nocturnal blood pressure regulation; thus, blood pressure is sensitive to changes during this rest, mainly by the sympathetic nervous system. Insomnia is a common disorder in the general population, with a prevalence of 5--50%.

Twenty-one percent of the participants in this Wisconsin study were designated as having a "nondipper" pattern, and 38% of them had symptoms of insomnia [12]. Loredo et al. reported that patients with "nondipping" nocturnal blood pressure were associated with polysomnographic indices of poor or incomplete sleep. These data suggest that poor sleep quality may have the same adverse effects as other cardiovascular factors long before the onset of the disease [12].

We found no relationship between hypertensive white coat syndrome and future cardiovascular events, since the number of these events was similar in patients with this pathology and normotensive patients. This study analyzed 22 new cardiovascular events in people who had hypertensive white coat syndrome and were older than 60 years with a high cardiometabolic load.

However, it was concluded that most of the people included in this study with white coat hypertensive syndrome should not be considered high-risk patients compared with normotensive patients. However, these patients should be followed up in the future because they risk developing hypertension [13]. Future studies should consider specific populations with renal failure, where increased mortality has been established owing to the presence of hypervolemia in patients with antihypertensives [14, 15] or anemia [16 ].

## Conclusions

Cardiovascular risk factors are present in all circadian rhythm patterns, highlighting the presence of bad habits in our entire population. The present study revealed that the nondipper pattern is the most prevalent pattern in the population studied, with 45%, followed by the dipper pattern, with 36.2%. The extreme dipper pattern was the least common in our study. The increase in cardiovascular risk was directly related to circadian patterns, especially those that did not have a correct decrease. Most patients who present with a proper reduction in blood pressure have a lower CVR. Extreme dipper, nondipper, and riser patterns are found in the population with the highest cardiovascular risk, where early and effective detection measures such as primary prevention could help us avoid reaching circadian rhythm patterns that are related to increased cardiovascular risk or treat them with pharmacological and nonpharmacological measures.

## References


1. Oparil S, Acelajado MC, Bakris GL, Berlowitz DR, Cífková R, Dominiczak AF, Grassi G, Jordan J, Poulter NR, Rodgers A, Whelton PK. Hypertension. Nat Rev Dis Primers. 2018 Mar 22;4:18014. doi: 10.1038/nrdp.2018.14. PMID: 29565029; PMCID: PMC6477925.
2. Simonenko VB, Fusin AIa, Ovchinnikov IuV, Aleksandrov AS. [Arterial hypertension in extreme situations]. Klin Med (Mosk). 2007;85(10):4-10. Russian. PMID: 18154171.
3. Abril J, Sanchez J. Características de la enfermedad renal crónica en el Ecuador desde el año 2009 hasta el año 2012. [Tesis] Universidad de Cuenca, Ecuador: 2014. dspace
4. Dietrich Meza C, Palma R, Torres O, Villaseñor A. Apego al tratamiento farmacológico en pacientes con hipertensión arterial sistémica y su asociación con el ciclo vital de la familia According to la OMS. Dialnet 2022;11(1):3-8. URL: Dialnet/8421325
5. Wagner P. Fisiopatología de la hipertensión arterial: nuevos conceptos. Rev. Peru. Ginecol. Obstet. 2018; 64(2):175-184. Scielo: doi: 10.31403/rpgo.v64i2075
6. Hermida RC, Mojón A, Fernández JR, Hermida-Ayala RG, Crespo JJ, Ríos MT, Domínguez-Sardiña M, Otero A, Smolensky MH. Elevated asleep blood pressure and nondipper 24 h patterning best predict risk for heart failure that can be averted by bedtime hypertension chronotherapy: A review of the published literature. Chronobiol Int. 2023 Jan;40(1):63-82. doi: 10.1080/07420528.2021.1939367. Epub 2021 Jun 30. PMID: 34190016.
7. García C, Micol M, Betrán D, Aran L, Pujol J. El ritmo circadiano de la presión arterial y su relación con los factores de riesgo cardiovascular. Enferm Nefrol. 2019;22(2):151-158. doi: 10.4321/s2254.
8. Cheng Y, Li Y, Wang J. Ambulatory blood pressure monitoring for the management of hypertension. Chin Med J (Engl). 2022 May 5;135(9):1027-1035. doi: 10.1097/CM9.0000000000002028. PMID: 35202040; PMCID: PMC9276356.
9. Ohkubo T, Satoh M. Prognostic Significance of Home and Ambulatory Blood Pressure: Summary of Longitudinal Evidence from the Ohasama Study. Tohoku J Exp Med. 2023 Aug 9;260(4):273-282. doi: 10.1620/tjem.2023.J045. Epub 2023 Jun 8. PMID: 37286522.
10. McEvoy JW, McCarthy CP, Bruno RM, Brouwers S, Canavan MD, Ceconi C, Christodorescu RM, Daskalopoulou SS, Ferro CJ, Gerdts E, Hanssen H, Harris J, Lauder L, McManus RJ, Molloy GJ, Rahimi K, Regitz-Zagrosek V, Rossi GP, Sandset EC, Scheenaerts B, Staessen JA, Uchmanowicz I, Volterrani M, Touyz RM; ESC Scientific Document Group. 2024 ESC Guidelines for the management of elevated blood pressure and hypertension. Eur Heart J. 2024 Oct 7;45(38):3912-4018. doi: 10.1093/eurheartj/ehae178. Erratum in: Eur Heart J. 2025 Feb 11:ehaf031. doi: 10.1093/eurheartj/ehaf031. PMID: 39210715.

11. de la Sierra A, Gorostidi M, Banegas JR, Segura J, de la Cruz JJ, Ruilope LM. Nocturnal hypertension or nondipping: which is better associated with the cardiovascular risk profile? Am J Hypertens. 2014 May;27(5):680-7. doi: 10.1093/ajh/hpt175. Epub 2013 Sep 23. PMID: 24061070.

12. Lyu B, Hagen EW, Ravelo LA, Peppard PE. Blood pressure dipping and sleep quality in the Wisconsin Sleep Cohort. J Hypertens. 2020 Mar;38(3):448-455. doi: 10.1097/HJH.0000000000002283. PMID: 31714339; PMCID: PMC7882242.

13. Mancia G, Facchetti R, Bombelli M, Cuspidi C, Grassi G. White-Coat Hypertension: Pathophysiological and Clinical Aspects: Excellence Award for Hypertension Research 2020. Hypertension. 2021 Dec;78(6):1677-1688. doi: 10.1161/HYPERTENSIONAHA.121.16489. Epub 2021 Nov 10. PMID: 34757765; PMCID: PMC9634724.

14. Mora-Bravo FG, Torres PTM, Campoverde NR, Carcelen GLB, Mancheno JCS, Tipanta ÁCS, Perez-Grovas H, Abarca WPR. Blood pressure control with active ultrafiltration measures and without antihypertensives is essential for survival in hemodiafiltration and hemodialysis programs for patients with CKD: a prospective observational study. BMC Nephrol. 2025 Jan 17;26(1):30. doi: 10.1186/s12882-025-03948-0. PMID: 39825259; PMCID: PMC11742504.

15. Rivera-González SC, Pérez-Grovas H, Madero M, Saavedra N, López-Rodriguez J, Lerma C. Identification of impeding factors for dry weight achievement in end-stage renal disease after appropriate kidney graft function. Artif Organs. 2014 Feb;38(2):113-20. doi: 10.1111/aor.12133. Epub 2013 Jul 25. PMID: 23889479.

16. Mora-Bravo F, Muñoz J. Impaired Reconversion of Bone Marrow in Nuclear Magnetic Resonance in Patients with Chronic Renal Disease. Curr Med Imaging. 2021;17(10):1256-1261. doi: 10.2174/1573405616999201118140832. PMID: 33213332.

## Statements

### Ethics committee approval and consent to participate

The bioethics committee of the Faculty of Medical Sciences, Catholic University of Santiago de Guayaquil, Guayaquil, Ecuador, approved the study.

### Consent to publish

This information was unnecessary because the present study did not publish images, radiographs, or specific patient studies.

### Conflicts of interest

The research has no financial interests or conflicts of interest and does not reflect the official policy or position of the organization or the government.

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