



The Relationship between Serum Albumin Levels and 24-h Ambulatory Blood Pressure Monitoring Recordings in Non-Diabetic Essential Hypertensive Patients

Elbis Ahabap¹, Tamer Sakaci¹, Ekrem Kara¹, Tuncay Sahutoglu¹, Yener Koc¹, Taner Basturk¹, Mustafa Sevinc¹, Cuneyt Akgol¹, Arzu O. Kayalar¹, Zuhale A. Ucar¹, Feyza Bayraktar¹, Nuri Baris Hasbal¹, Mahmoud Islem¹, Perin Nazif¹, Abdulkadir Unsal¹

¹Sisli Etfal Training and Research Hospital, Department of Nephrology, Istanbul, Turkey.

¹Recep Tayyip Erdogan University, School of Medicine, Rize Educational and Research Hospital, Internal Medicine, Nephrology, Rize, Turkey.

Objectives:

The goal of this study was to evaluate the relationship between serum albumin levels and 24-hour ambulatory blood pressure monitoring (24-h ABPM) recordings in non-diabetic essential hypertensive patients.

Methods:

A total of 354 patients (mean [SD] age: 55.5 [14.3] years, 50% females) with essential hypertension and 24-h ABPM recordings were included. Patient 24-h nighttime and daytime ABPM values, systolic and diastolic dipping status and average nocturnal dipping were recorded. The correlations between serum albumin levels and nocturnal systolic and diastolic dipping were evaluated, and correlates of average nocturnal systolic dipping were determined via a linear regression model.

Results:

Overall, 73.2% of patients were determined to be non-dippers. The mean (SD) levels of serum albumin (4.2 [0.3] g/dL vs. 4.4 [0.4] g/dL, $p < 0.001$) and the average nocturnal systolic (15.2 [4.8] mmHg vs. 0.3 [6.6] mmHg, $p < 0.001$) and diastolic dipping (4.2 [8.6] mmHg vs. 18.9 [7.0] mmHg, $p < 0.001$) were significantly lower in nondippers than in dippers. A significant positive correlation was noted between serum albumin levels and both systolic ($r = 0.297$, $p < 0.001$) and diastolic dipping ($r = 0.265$, $p < 0.001$). The linear regression analysis revealed that for each one-unit increase in serum albumin, the average nocturnal dip in systolic BP increased by 0.17 mmHg ($p = 0.033$).

Table 1 - Baseline characteristics and 24-h ambulatory blood pressure monitoring recordings in dippers vs. non-dippers.

Patient characteristics	Dippers (n=95)	Non-dippers (n=259)	p value ^a
Age (years), mean (SD)	53.4 (15.5)	56.3 (13.8)	0.092
Gender (M/F)	47/48	130/129	1.000
BMI (kg/m ²), mean (SD)	30.9 (4.8)	30.1 (5.7)	0.554
Antihypertensive medication	%	%	
ACE inhibitor	36.7	33.3	0.687
Angiotensin receptor blocker	32.6	28.8	0.547
Beta-blocker	18.4	16.8	0.773
Calcium channel blocker	12.6	16.4	0.476
Diuretics	21.3	19.8	0.871
24-h ABPM recordings (mmHg)	Mean (SD)	Mean (SD)	
Overall			
24-h systolic BP	148.2 (20.1)	152.6 (20.9)	0.078
24-h diastolic BP	84.6 (13.1)	85.0 (14.8)	0.822
Daytime			
Systolic BP	154.1 (20.7)	152.7 (20.5)	0.590
Diastolic BP	89.0 (13.9)	85.8 (15.0)	0.077
Nighttime			
Systolic BP	130.8 (17.6)	152.3 (23.9)	<0.001
Diastolic BP	71.8 (11.7)	82.3 (15.9)	<0.001
Average nocturnal dipping			
Systolic	15.2 (4.8)	0.3 (6.6)	<0.001
Diastolic	18.9 (7.0)	4.2 (8.6)	<0.001

ABPM: ambulatory blood pressure monitoring; ACE: angiotensin-converting enzyme; BP: blood pressure; BMI: body mass index.

^aChi-square (χ^2) test, ^bStudent's t-test

Table 2 - 24-h Ambulatory blood pressure monitoring recordings according to quartiles of serum albumin levels.

Serum albumin levels	Mean (SD)	ABPM recordings					
		Overall-24 h		Daytime (mmHg)		Nighttime (mmHg)	
		Systolic BP	Diastolic BP	Systolic BP	Diastolic BP	Systolic BP	Diastolic BP
Albumin quartiles	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Q1 (n=71)	3.6(0.5)	157.8(19.0)	89.1(15.2)	157.6(18.7)	89.8(15.1)	158.6(23.1)	87.0(17.5)
Q2 (n=100)	4.2(0.1)***	148.7(19.6)*	81.6(11.5)**	150.5(19.3)	83.3(12.0)*	143.8(22.5)***	76.0(12.1)***
Q3 (n=78)	4.4(0.2)***	151.5(23.8)	83.9(15.7)	153.1(23.2)	85.7(16.1)	145.7(27.9)***	78.6(16.4)***
Q4 (n=105)	4.7(0.1)***	149.6(20.0)*	85.8(14.6)	152.5(20.5)	88.5(15.3)	141.3(21.6)***	78.3(15.0)***

BP: blood pressure; SD: standard deviation; Q: quartile

Q1: serum albumin < 4.1 g/dL

Q2: serum albumin $\geq 4.1 < 4.4$ g/dL

Q3: serum albumin $\geq 4.4 < 4.6$ g/dL

Q4: serum albumin ≥ 4.6 g/dL

* $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$ compared to Q1; ANOVA and post-hoc Tukey tests

Conclusions:

Our findings indicate an association between serum albumin levels and the deterioration of circadian BP rhythm among essential hypertensive patients along with the identification of a non-dipper pattern in more than two-thirds of patients. Our findings emphasize the importance of serum albumin levels, rather than urinary albumin excretion, as an independent predictor of nocturnal systolic dipping, at least in non-diabetic essential hypertensive patients with moderate proteinuria.