



# Hyponatremia: Is it related to the seasons?

Atila Altuntaş<sup>1</sup>, Veysel Kıdır<sup>1</sup>, Salih İnal<sup>1</sup>, Süleyman Diker<sup>2</sup>, Naci Çil<sup>2</sup>, Hikmet Orhan<sup>3</sup>, Mehmet Tuğrul Sezer<sup>1</sup>

<sup>1</sup>Süleyman Demirel University, School of Medicine, Department of Internal Medicine, Division of Nephrology, Isparta, Turkey.

<sup>2</sup>Süleyman Demirel University, School of Medicine, Department of Internal Medicine, Isparta, Turkey.

<sup>3</sup>Süleyman Demirel University, School of Medicine, Department of Biostatistics and Medical Informatics, Isparta, Turkey.

**Introduction:** Hyponatremia is a common electrolyte disorder in in-patients and related with mortality and morbidity. In this study we aimed to examine whether there is a relationship between in-patients with hyponatremia and seasonal change.

**Methods:** The patients who were in-patients in our service in 2012 were retrospectively analyzed. Sodium level < 135 mEq/L was accepted as hyponatremia. Characteristics of the patients were collected from their files. Hyponatremia incidence was calculated as the proportion of in-patients with low sodium levels in a season to total number of in-patients in the same season.

**Results:** Of a total of 450 in-patients in our service in one year period, 118 were found to have hyponatremia (118/450). Of the patients with hyponatremia, 60 were male. Mean serum sodium level of the patients was 129.4±5.3 meq/L. Distribution of accompanying diseases and drug use of hyponatremia patients according to seasons is presented in Table 1. Hyponatremia incidence in autumn, winter, spring and summer were found to be (26/90) 28.8%; (17/109) 15.5%; (21/103) 20.3% and (54/148) 36.4% respectively. We found no significant difference in distribution of hyponatremia patients according to seasons in terms of accompanying diseases, drug use, mortality and dialysis treatment. Comparison of hyponatremia incidence in in-patients in winter and summer revealed a significantly higher hyponatremia incidence in summer (p=0.0001). We found a positive correlation between hyponatremia incidence and temperature (r=0.973, p=0.027). However, there was a negative correlation between hyponatremia incidence and relative humidity (r =-0.915, p= 0.05).

**Conclusion:** The highest hyponatremia incidence was observed in summer in one-year period. Loss of sodium by perspiration along with increased temperature and/or excessive hypotonic fluid intake might contribute to development of hyponatremia. Therefore, electrolyte-containing fluids can be consumed to reduce hyponatremia related morbidity and mortality in geographic regions with increased temperatures and decreased humidity ratios especially in summer season.

**Table 1.** Clinical and demographic data of the patients according to the seasons.

	Autumn	Winter	Spring	Summer	P value
Age (years)	66.7±10.5	65.1±17.5	61.5±12.1	63.9±17.8	0.70
Female/Male	13/13	8/9	14/7	23/31	0.31
Serum sodium (mEq/L)	128±5.5	131±3.5	129±4.2	129±6	0.32
Creatinine (mg/dL)	4.58±2.7	4.7±3.26	5.36±4.35	5.13±3.77	0.86
BUN (mg/dL)	67.5±48.5	69.3±38.6	62.7±31.1	67.4±48.5	0.97
Systolic BP (mm Hg)	121.9±26.2	110.5±29.9	114.1±26	120.3±31.2	0.51
Diastolic BP (mm Hg)	72.1±18	69.1±14.5	70±18.1	71.2±16.6	0.93
Incidence of hyponatremia (%)	%28.8 <sup>a</sup>	%15.5 <sup>a,b</sup>	%20.3 <sup>c</sup>	%36.4 <sup>b,c</sup>	<b>0.0001</b>
<b>Existing disease</b>					
CKD (+/-)	21/5	13/4	11/10	38/16	0.18
AKI (+/-)	8/18	3/14	10/11	22/32	0.21
CHF (+/-)	2/24	4/13	1/20	9/45	0.26
Nephrotic syndrome (+/-)	0/26	1/16	4/17	3/51	<b>0.07</b>
Cirrhosis (+/-)	0/26	0/17	0/21	1/53	0.75
Diabetes mellitus (+/-)	15/11	6/11	9/12	18/36	0.21
Hypertension (+/-)	18/8	9/8	11/10	24/30	0.23
<b>Medication use</b>					
ACEI/ARB (+/-)	11/15	4/13	4/17	17/37	0.33
CCB (+/-)	7/19	5/12	3/18	16/38	0.58
Thiazide (+/-)	6/20	2/15	3/18	7/47	0.64
Furosemide (+/-)	3/23	4/13	5/16	10/44	0.68
Spirolactone (+/-)	1/25	1/16	0/21	6/48	0.32
<b>Volume status</b>					
Hypovolemic	11 (%42.3)	14 (%82,4)	17 (%81)	32 (%59.3)	<b>0.038</b>
Euvolemic	1 (%3.2)	0	0	0	
Hypervolemic	14 (%53.8) <sup>a,b</sup>	3 (%17.6) <sup>a,c</sup>	4 (%19) <sup>b,d</sup>	22 (%40.7) <sup>c,d</sup>	

Note: Values for continuous variables are given as mean ± standard deviation; values for categorical variables are given as number (percentage).

Abbreviations: BUN, blood urea nitrogen; BP, blood pressure; CKD, chronic kidney disease; AKI, acute kidney injury; CHF, congestive heart failure; CCB, Calcium channel blocker; ACEI, angiotensin converting enzyme inhibitor; ARB, angiotensin receptor blocker; (+/-), positive-negative. <sup>a,b,c,d</sup> There is a significant difference between the parameters marked with the same letter (p<0.05)

