

## EFFECTS OF DAILY SALT INTAKE ON URINARY SYMPTOMS: A COMPARISON BETWEEN PATIENTS WITH HYPERTENSION AND NORMAL BLOOD PRESSURE

### Hypothesis / aims of study

There is an association between hypertension and urinary symptoms, including nocturia [1]. Although excessive salt intake can cause hypertension, few studies have examined the relationship between daily salt intake and urinary symptoms.

The daily salt intake of Japanese people is traditionally high. The Japanese Society of Hypertension Guidelines for the Management of Hypertension (JST2014) recommends monitoring daily salt intake. Our clinical experience showed that many patients with hypertension benefited from controlling their daily salt intake, suggesting the importance of managing salt intake for treating hypertension. We hypothesized that hypertensive and normal individuals may have urinary symptoms as a consequence of increased circulating plasma due to excessive daily salt intake. This study aimed to examine the effects of daily salt intake on urinary function in patients with hypertension and normal blood pressure.

### Study design, materials and methods

The subjects were patients being followed at our department. In accordance with the guidelines for managing hypertension in Japan, we defined hypertension as a systolic blood pressure of  $\geq 140$  mmHg and/or a diastolic blood pressure of  $\geq 90$  mmHg, or patients who were receiving treatment for hypertension. The subjects were divided into the Hypertension group (H group) and Non-hypertension group (N-H group). Exclusion criteria were acute inflammation in the urological organ and an abnormal condition that may affect the urinary function, including a history of surgery in the pelvis, benign prostatic hyperplasia, and neurogenic bladder. The daily salt intake was estimated by examining the sodium and creatinine concentrations of spot urine samples using a formula that was adjusted for body height, body weight, and age [2]. The relationship between the urinary symptoms and daily salt intake was also examined using the Core Lower Urinary Symptom Score (CLSS).

### Results

In total, 688 patients were enrolled after obtaining informed consent. The patients' characteristics and estimated daily salt intake are shown in Table 1. The H group was significantly older and had a significantly higher body mass index and a higher estimated daily salt intake compared to the N-H group. The H group also had a significantly higher daytime frequency, nighttime frequency, diurnal urine volume, nocturnal urine volume, and nocturnal polyuria index (NPI) compared to the N-H group (Table 2). Regarding the CLSS, the H group had significantly higher sub-scores relating to storage symptoms and pain, suggesting a significant influence on the quality of life (QOL) (Table 3). Furthermore, the estimated daily salt intake significantly correlated with daytime frequency, nighttime frequency, and NPI (Figure 1).

Table 1. Patient characteristics and estimated daily salt intake

	N-HGroup	H Group	P ratio
Number of patients	355(M: 95, F:260)	333(M:120,F:213)	-
Age(y.o)	59.5 $\pm$ 14.6	66.0 $\pm$ 12.9	<0.0001
Body Mass Index	21.3 $\pm$ 3.3	23.3 $\pm$ 5.1	<0.0001
Blood Pressure(mmHg)	118.9 $\pm$ 12.8	152.6 $\pm$ 18.2	<0.0001
*SUNa(mEq/L)	92.0 $\pm$ 50.5	107.3 $\pm$ 47.4	<0.0001
Estimated 24-hr Urinary Na excretion (mEq/day)	144.7 $\pm$ 39.9	176.1 $\pm$ 45.7	<0.0001
Estimated daily salt intake(g/day)	8.4 $\pm$ 2.3	10.4 $\pm$ 2.7	<0.0001

\*: Na concentration in the spot urine

Table 2. Comparison between two groups on Urinary frequency and volume

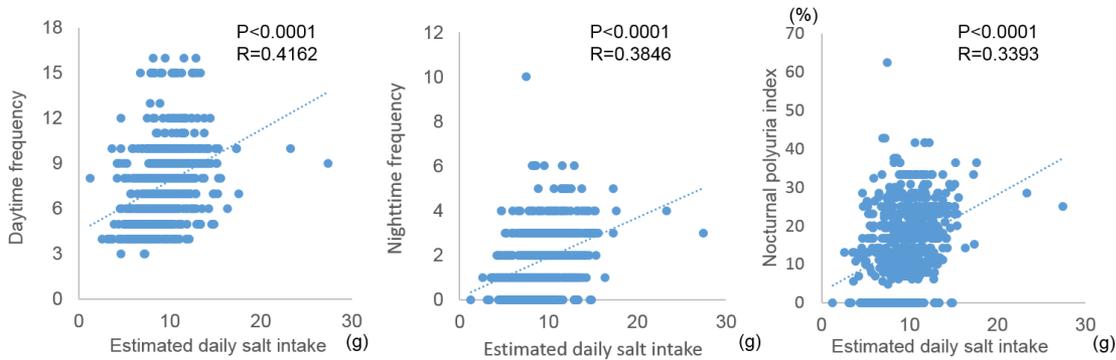
	N-H Group	H Group	P ratio
Daytime frequency	6.4 $\pm$ 2.0	9.1 $\pm$ 2.4	<0.0001
Nighttime frequency	1.0 $\pm$ 1.0	2.6 $\pm$ 1.2	<0.0001
Diurnal urine volume (ml)	1590 $\pm$ 502.3	1811.7 $\pm$ 477.7	<0.0001
Nocturnal urine volume (ml)	153.7 $\pm$ 146.8	517.7 $\pm$ 241.1	<0.0001
Nocturnal polyuria index (%)	8.1 $\pm$ 7.4	21.7 $\pm$ 7.9	<0.0001

Table 3. Comparison between two groups on Core Lower Urinary Symptom Score

	N-HGroup	H Group	P ratio
Daytime frequency	0.4 $\pm$ 0.7	1.3 $\pm$ 0.9	<0.0001
Nocturia	1.0 $\pm$ 0.9	2.1 $\pm$ 0.7	<0.0001
Urgency	0.9 $\pm$ 1.0	1.2 $\pm$ 1.0	<0.0001
Urgency incontinence	0.8 $\pm$ 1.0	0.8 $\pm$ 1.0	0.2356
Stress incontinence	0.6 $\pm$ 0.9	0.7 $\pm$ 0.9	0.7230
Slow stream	1.4 $\pm$ 1.2	1.6 $\pm$ 1.1	0.0533
Strain	1.0 $\pm$ 1.2	1.6 $\pm$ 1.1	0.0265
Incomplete emptying	1.0 $\pm$ 1.1	1.0 $\pm$ 1.1	0.3429

Bladder pain	0.2±0.7	0.4±0.8	0.0001
Urethral pain	0.2±0.6	0.3±0.7	0.0001
QOL index	3.5±1.7	3.9±1.5	0.0043

Figure 1. Correlations of the estimated daily salt intake with daytime and nighttime urinary frequency and the nocturnal polyuria index.



#### Interpretation of results

The H group had a significantly higher blood pressure and higher estimated daily salt intake compared to the N-H group. In addition, the H group had significantly higher sub-scores relating to overactive bladder, including daytime frequency, nighttime frequency, and the urge to urinate, suggesting the effects on QOL. Furthermore, the estimated daily salt intake was significantly correlated with daytime frequency, nighttime frequency, and the NPi, irrespective of hypertension.

The causes of hypertension include an increased vascular resistance and increased amount of circulating plasma, the latter of which may be due to excessive salt intake. Thus, excessive salt intake may cause frequent urination and the urge to urinate.

#### Concluding message

Excessive salt intake can cause urinary symptoms (e.g., frequent urination, excessive urination, and the urge to urinate) in patients with hypertension and normal blood pressure.

#### References

- 1 LUTS 2009,1:16-19
- 2 J Hum Hypertens 2002,16:97-103

#### Disclosures

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