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Letter to the Editor

High fractional potassium excretion in symptomatic hyponatremia

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In experimental SIADH induce in man [1] or animal [2–4] it is well know that not only sodium excretion increase during a few days (particularly if it is acute), the same as been reported for potassium excretion although to a lesser extent. This high potassium excretion is considered to reflect cell adaptation to hypotonicity, it is usually transient (a few days) and depends on the speed by which SNa is decreasing [2–4].

Measurement of fractional sodium or potassium excretion is well known to help us in the differential diagnosis of hyponatremia and of hypokalemia [5]. It has the advantage to avoid a 24 h urine collection as it can be done on a urine spot sample.

The present study is a retrospective study to see if fractional potassium excretion is increased in some symptomatic hyponatremic patients.

We analyzed retrospectively, over the last ten years, 69 consecutive patients admitted in our departments with a SNa $<$ 125 mEq/l, in who electrolyte and creatinine levels were available in serum and on a concomitant urine sample (unfortunately urine creatinine levels were not availed in most patients so that fractional excretion could not be calculated). Tubular reabsorption of a substance can be evaluated by measurement of the fractional excretion of that filtered substance (FE). This is easily obtained by measuring the concentration of creatinine and the substance simultaneously in blood and a spot urine collection (FE.X (in %) = Ux/Px.Pcreat/Ucreat x 100).

Only data before any treatment were considered. All patients presented a normal glucose levels (to avoid glucosuria which could affect FE.K) and no acetonuria. Patients were considered asymptomatic if no symptoms were mentioned on admission medical report. We classify patients as symptomatic if it was mentioned at admission symptoms like confusion, somnolence, stupor, coma, seizure or fall. Fractional phosphate clearance was also available in some patients. Hypervolemic patients were not included in the study (cardiac failure, cirrhosis, and nephrosis).

After confirming that the data exhibited a Gaussian distribution by applying the Kolmogorov and Smirnov test, we applied a student *t*-test or paired *t*-test.

This retrospective study was approved by local Ethisch Committee.

As expected mean SNa (116 ± 6 mEq/l) of the symptomatic patients (n = 39) was lower than the asymptomatic patients (119 ± 4 mEq/l; p $<$ .001) (n = 30).

Fig. 1 shows the FE.K distribution in the hyponatremic patients without (n = 30) and with symptoms (n = 39). Of the 69 patients with hyponatremia, 12 were secondary to polydipsia, 14 to diuretics, 7 to salt depletion and 36 to SIADH. All the patients considered as asymptomatic presented a FE.K lower than 15%. In the symptomatic patients, 24 presented a FE.K higher than 15%, and 19 higher than 16%. If we exclude the patients with diuretic induce hyponatremia there was still 17 on 24 with a FE.K higher than 15% and 14 of the 24 patients with a FE.K higher than 16% (about 60%). In the 11 patients with fall as the only symptoms, 6 presented a FE.K lower than 15% and of the 5 patients with seizure, 2 presented a value of FE.K lower than 15%.

Table 1 presents the mean value of different biochemical parameters of 34 patients with a SNa between 110 mEq/l and 124 mEq/l. Each asymptomatic patients (n = 17) was paired to a symptomatic patients with a similar diagnosis and with a SNa that did not differ by $>$ 3 mEq/l. Only euvolemic patients were included. Patients with hyponatremia related to diuretic intake were also not included in Table 1. Mean FE.K in these asymptomatic patients (n = 17) was 7.2 ± 3% while it was 15.8 ± 6.7% (p $<$ .001) in the symptomatic patients with similar level of SNa and of FE.Na. Symptomatic patients presented also a higher FE.PO_4 (25.3 ± 12%) (p $<$ .001).

Our data shows that patients with hyponatremia associated with neurological symptoms presented more frequently an FE.K $>$ 15–16%. This reflect likely that cells were adapting to hyponatremia by decreasing their intracellular potassium content and this is particularly important for the brain to avoid brain edema with risk of herniation and respiratory arrest [3,4]. In patients on diuretics (mainly thiazide) this could reflect in some of them, the well-known increase in kaliuria with these medications. We also know that hyponatremia could sometimes develop rapidly with their intake which could also contribute to the high FE.K. In patients with hyponatremia related to polydipsia we noted also frequently a high FE.K. It is well know that this is a classically cause of acute hyponatremia [4]. In patients with primary polydipsia but without hyponatremia we observe a normal FE.K value [6].

Major volume expansion can also be associated with an increase in kaliuresis, which is attributed to the natriuretic factors [7]. Three of our patients presented a FE.Na higher than 2% and a FE.K higher than 30% in two of them and in one 19%. These three patients were not included in our Table 1. In our symptomatic or asymptomatic patients FE.Na was similar (around 0.8%). We observe also a high FE.PO_4 in many symptomatic patients with hyponatremia. The same observations are reported in experimental models of acute hyponatremia induce in rats

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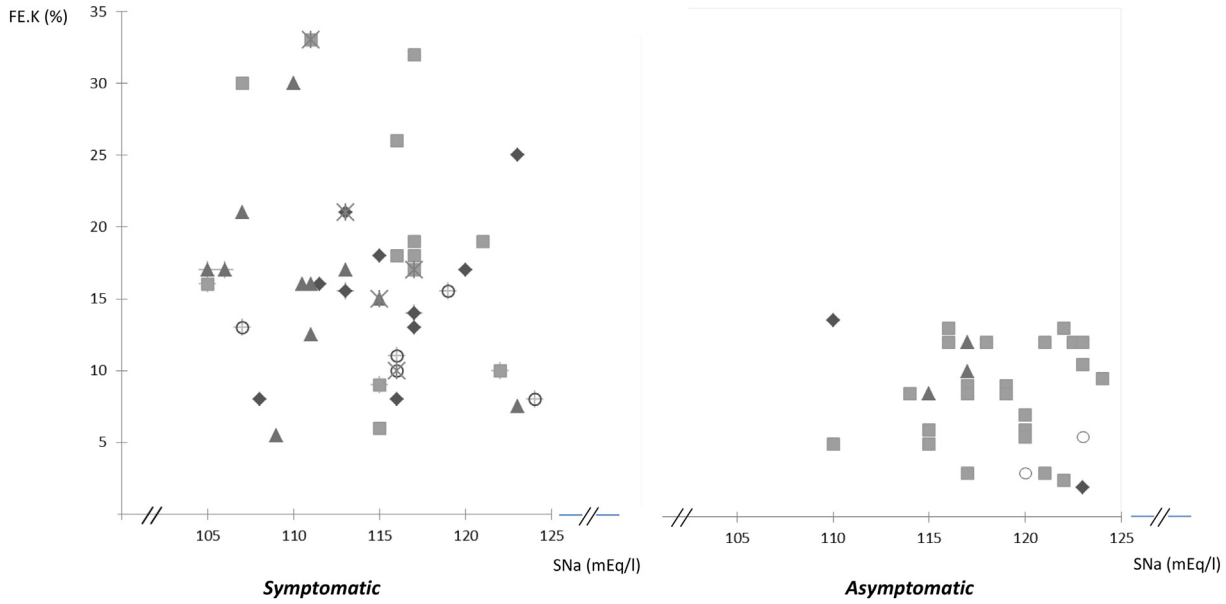

Fig. 1. Distribution of FE.K in symptomatic (S) and asymptomatic (AS) patients with severe hyponatremia (< 125 mEq/l) of different origins. Polydipsia is represented by ♦, SIADH by ■, Diuretic by ▲, Salt Depletion by ◯, Epilepsia by ✳ and Fall by +.

Table 1
Some biochemical data in patients with euvolemic hyponatremia (SIADH or primary polydipsia) of similar level classified according to the presence or not of symptoms (Patients with diuretic intake where excluded).

	Asymptomatic (mean ± SD) (n = 17)	Symptomatic (mean ± SD) (n = 17)
Age (year)	58 ± 15	64 ± 14
Body weight (kg)	64 ± 12	65 ± 13
SNa (mEq/l)	118 ± 4.6	117 ± 5
K (mEq/l)	4.1 ± 0.4	3.7 ± 0.5*
Creatinine (mg/dl)	0.77 ± 0.18	0.78 ± 0.25
Urea (mg/dl)	22 ± 7.5	21 ± 11
PO_4 (mg/dl) (n = 11)	2.8 ± 0.8	2.9 ± 0.8
FE.Na (%)	0.75 ± 0.35	0.90 ± 0.45
FE.K (%)	7.2 ± 3	15.8 ± 6.7**
FE.PO_4 (%) (n = 11)	13 ± 5.5	25.3 ± 12**
Uosm (mOsm/kg)	454 ± 197	384 ± 174

To convert urea (mg/dl) in mmol/l multiplied by 0.1665.
To convert creatinine (mg/dl) in μmol/l multiplied by 88.4.
The mean FE.K in normal subject is 8% in our hospital (range 4–16%) (same as Ref. 8).
The normal value for FE.Na in our hospital is 0.8 ± 0.35%.
* $p < .02$.
** $p < .001$.

[3]. The high phosphate excretion contributes to the need of electroneutrality of the urine [3]. We can expect that patients with a low FE.K and severe hyponatremia (< 115 mEq/l) with neurological symptoms are particularly at risk of ODS if over treated. Five of the 11 patients with fall as only symptoms presented a high FE.K. We included in our study only patients with a SNa lower than 125, how are more likely to present some brain edema. In a large series of patients with fall, the mean SNa reported was 131 mEq/l, but in this previous study patients were included whatever the level of hyponatremia (< 135 mEq/l) [8], the excess fall in these patients were in most of them not the result of some brain edema. We have shown that elderly are much more sensitive to gait and attention deficit when presenting mild hyponatremia [9]. A decrease in nerve velocity could play a role in this [10].

In the symptomatic patients it is likely that some of them presented an acute component on chronic hyponatremia (like introduction of a medication that are associated with antidiuresis, or modification in water intake, or both). Whether a high FE.K reflect frequently some brain edema stay to be demonstrated.

Conflict of interest statement

None.

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