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# Tolouian Sign in Hyponatremia

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The clinical implication of this sign at the bedside is very valuable. When the hair mostly regains its normalcy and looks healthy again, serum Na should be around 130 mEq/L.
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Editorial

A 55-year-old man presented to the emergency room with complaints of frequent falls, a generalized "not feeling well" and was found to have hyponatremia (Serum Na: 112 mEq/L).

Hyponatremia is the most common electrolyte abnormality in clinical medicine. It is estimated that about 67% of all hyponatremia was hospital-acquired. Severe hyponatremia (Serum Na <120 mEq/L) were observed in 12% of the hyponatremic patients. The prevalence of hyponatremia in the community remains unknown, but in general hospital in patients >65 years is around 30% (1-3).

The serum sodium level of 140 mEq/L is considered normal. Serum sodium below the normal range is considered hyponatremia, but there is no definite consensus about the exact number, to define hyponatremia. The reproducibility of measuring serum Na for analytical precision would be ± 3.0 mEq/L, assuming no physiologic changes. Therefore, a value of 140 mEq/L is somewhere between 137-143 mEq/L, 95% of the time (4). Thus, it is reasonable and safe to define hyponatremia is as a serum Na concentration of less than 136 mEq/L.

There are multiple studies that have defined hyponatremia as Na concentration of <135 mEq/L while others have defined it as <134 meq/L. In older studies, serum Na <130 mEq/L was considered a clinically meaningful hyponatremia because a serum Na level between 130-135 mEq/L was categorized as asymptomatic hyponatremia. Over the years, more studies have shown that patients with "asymptomatic hyponatremia" have a greater risk for brain damage, falls, bone fractures and cognitive impairment as compared to age-matched controls (5). It seems, as the concept of asymptomatic hyponatremia fades away, the number to define hyponatremia is heading upward.

The serum Na is determined by the exchangeable Na/total body water ratio (Simplified Edelman equation).

Serum (Na+) ~ total body Na/total body water

According to the mathematical standard, if one reduces the numerator, or increases the denominator, the serum Na will drop. In clinical practice, hyponatremia caused by reducing the numerator such as low-sodium intake or electrolyte loss, inhabits a small percentage of the hyponatremic population. Most of the hyponatremia cases are secondary to dilution from retained water and the Vasopressin role in sodium hemostasis. Regardless of the pathogenesis, the low serum Na is causing the clinical problems (6).

The signs and symptoms of hyponatremia are not specific. The first case of documented hyponatremia was well described by Helwig in 1938. A patient who had received tap water proctoclysis post-surgery, started to experience neck pain and began to perspire. Subsequently, with worsening of the hyponatremia-nausea, vomiting, headache, tremor and stupor manifested. The patient's general condition deteriorated and eventually progressed with seizures, opisthotonos, dilated pupils which ensued to death 41 hours after surgery (7). Most of the symptoms of hyponatremia are attributed to brain swelling and edema. There are no specific or reliable early signs in the physical examination related to hyponatremia. Tremor, seizure and coma are the late signs of advanced hyponatremia and mostly are non-specific.

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One of the physical findings that this writer proposes as *"Tolouian sign"* is- hair changes in the setting of hyponatremia. As patient serum Na declines, the hair becomes more unkempt, oily, and stands upward; appearing dirty yet wiry looking. At the same time, you can visualize the scalp as the hairs become more upward and unkempt (Figure 1A). These strange and notable hair findings start returning to normal with the correction of hyponatremia, i.e., less thin, oily looking and wiry (Figures 1B and 1C). When the serum Na goes above 130 the hair mostly regains its normalcy and again looks healthy (Figure 1D). These changes can be observed in the beard and moustache as well (Figure 1E). It seems that hair changes happen in order to diminish losing body temperature.

Body temperature and thermogenesis are mostly dependent on the activity of Na/K-ATPase pump and constant Na concentration gradient across the membrane. In the hypernatremia setting, the higher gradient of Na across the membrane could promote higher thermogenesis and body temperature (8). Based on this finding, it is presumed that lower-gradient of Na across the membrane could decrease thermogenesis and brings down the body temperature. Trapping air acts as an insulating layer over the skin. Autonomic sympathetic activity mediated by α-1 adrenergic receptors are responsible for the piloerection and air trapping. The phenomenon of air trapping is well recognized in animals and humans during cold exposure and emotional stress. The main bulk of hair on humans is on the head. The body and extremities have little hairs which most of the time are covered by clothes and air trapping therefore, is trivial (9). Hyponatremia probably changes the threshold for sweating, core temperature and thermogenesis.


**Figure 1.** Hair changes in the setting of hyponatremia.

The clinical implication of this sign at the bedside is very valuable. When hair characteristics changed to looking healthy, combed, and not being able to see the scalp, it means patient's sodium level is in the right direction of correction and has gone up. One may argue, that with the patient's general condition improving and taking shower the hair becomes tamer, we ruled that out by observation.

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## Author's contribution

RT is the single author of the manuscript.

## Conflicts of interest

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## Ethical considerations

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