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Dysnatraemias in the emergency room: Undetected, untreated, unknown?

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Dysnatriämien an der Notfallaufnahme: Unentdeckt, unbehandelt, unbekannt?

Zusammenfassung. *Hintergrund:* Hypo- und Hypernatriämie sind die häufigsten Elektrolytstörungen im Krankenhaus und wurden mit erhöhter Mortalität assoziiert. Zur Zeit gibt es nur wenige Daten zur Prävalenz der Dysnatriämien an der Notfallaufnahme sowie zu den Charakteristika der Patienten mit Hypo- und Hypernatriämien.

Methodik: In diese retrospektive Studie wurden Patienten welche zwischen 01.09.2010 und 30.11.2010 an der Notfallaufnahme einer Universitätsklinik eine Bestimmung des Serum-Natriums erhielten eingeschlossen.

Resultate: Insgesamt wurden während des Studienzeitraumes an 3.182 Patienten Bestimmungen des Serum-Natriums durchgeführt. 124 Patienten (4%) wiesen bei Aufnahme in die Notfallaufnahme eine Hyponatriämie auf, während 400 Patienten (13%) eine Hypernatriämie aufwiesen. Es zeigte sich kein Unterschied im Alter zwischen jenen Patienten welche eine Hypernatriämie aufwiesen und jenen welche normonatriem waren. Patienten mit Hyponatriämie waren hingegen signifikant älter.

Schlussfolgerungen: Beinahe 1 von 5 Patienten weist bei Aufnahme an der Notfallaufnahme eine Störung des Natriumhaushalts auf. Im Gegensatz zu hospitalisierten Patienten war an der Notfallaufnahme die Prävalenz der Hypernatriämie bedeutend grösser als jene der Hyponatriämie. Überraschenderweise waren Patienten mit Hyponatriämie signifikant älter als jene mit Hypernatriämie und jene mit normalen Serum-Natriumwerten.

Summary. *Background:* Hypo- and hypernatraemia are the most common electrolyte disorders in hospitalized patients and have been associated with increased mortality.

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However, data on the prevalence of dysnatraemias in the emergency room and the characteristics of patients presenting with them are rare.

Methods: In this retrospective study, we analyzed data from patients who presented to the emergency department of a large tertiary university hospital between September 1st 2010 and November 30th 2010 and who received measurement of serum sodium.

Results: 3,182 patients received measurement of serum sodium during the three-month study period. 124 patients (4%) presented with hyponatraemia on admission to the emergency department while 400 patients (13%) presented with hypernatraemia. While there was no difference in age between patients with hypernatraemia and those who were normonatremic, patients with hyponatraemia were significantly older.

Conclusion: Dysnatraemias are present in almost 1 in 5 patients who presented to the emergency department. Contrarily to patients who are already hospitalized, hypernatraemia was by far more common than hyponatraemia in patients at the emergency department. Surprisingly, patients with hyponatraemia were significantly older than normonatremic patients while there was no age difference in hypernatremic patients. Dysnatraemias are common in the emergency room and further studies are indicated to evaluate the causes and the impact on outcome of patients.

Key words: Hyponatremia, hypernatremia, emergency room, sodium, prevalence, elderly patients.

Introduction

Dysnatraemias are common in critically ill patients on admission to the intensive care unit (ICU) [1]. Both hypo- and hypernatraemia present on admission to the ICU have been associated with substantially increased mortality, independent of age, sex, type of diagnosis on admission and severity of disease as quantified by the severe acute

physiology score (SAPS) II [1]. Interestingly, this association extended to only minimal deviations of serum sodium from the normal range. However, there is a lack of studies on dysnatremias in the emergency room collective.

Recently, patients with hyponatraemia have been associated with an increased susceptibility to falls [2]. It was also shown that hyponatraemia leads to a reduction in bone mass, termed hyponatraemia-induced osteoporosis [3]. This vicious cycle of increased tendency to fall and higher fracture risk due to reduced bone mass has recently been described in several epidemiological studies [4–6]. These changes were also seen with only mild deviations of serum sodium from the normal range. By contrast, complications of hypernatraemia and consequent hyperosmolality are manifold, and include decrease in cardiac contractility, decreased glucose utilization, insulin resistance, cognitive impairment and cerebral shrinkage leading to vascular rupture [7–12].

Amongst many recent studies on hypo- and hypernatraemia in critically ill patients [1, 13–18], the prevalence of hyponatraemia on admission to an emergency room has been investigated in only one study performed in Taiwan [19]. To our knowledge, no study has been conducted to investigate the prevalence of hypo- and hypernatraemia in the emergency room setting in Europe or North America.

Patients, materials and methods

We analysed sodium values measured over a three-month period (1 September 2010 to 30 November 2010) in patients admitted to the Department of Emergency Medicine of the Inselspital, University Hospital Bern, Switzerland. The distribution of dysnatraemia by age and sex of the patients was also evaluated. In accordance with the normal range in use by the local central laboratory that performed the measurements, hyponatraemia was defined as <132 mmol/L and hypernatraemia as >142 mmol/L (normal range at central laboratory of our institution).

All results are given as means and standard deviation (SD).

Results

3,182 patients (mean age 53 years [SD 21], 57% male, 43% female) were included in this analysis. Serum sodium values were in the range 111–153 mmol/L, with a mean of 139 mmol/L (SD 4). Of all these admissions, 1404 (44%) were for surgical causes and 1778 (56%) for medical causes.

Figure 1 shows the distribution of serum sodium on admission to the emergency room over the three-month period.

524 (17%) of all patients showed dysnatraemia on admission. 124 (4%) patients (mean age 64 years [SD 16], 56% male, 44% female) were hyponatraemic, with a mean serum sodium of 127 mmol/L (SD 4). 400 patients (13%) were hypernatraemic (mean age 53 years [SD 22], 59% male, 41% female), with a mean serum sodium of 144 mmol/L (SD 2). Of the 124 hyponatraemic admissions, 40 (32%) were admitted for surgical and 84 (68%) for medical reasons. Of the 400 patients with hypernatraemia 182 (46%) were of a surgical type of admission and 218 (54%) of a medical type. 4 patients (1%) during the study period had hypernatraemia as their main admission diagnosis and were neurologically symptomatic on admission. 15 patients (12%) were admitted during the study period with hyponatraemia as their main diagnosis with 8 (6%) of them being neurologically symptomatic on admission.

Hyponatraemic patients were significantly older (64 years) than patients either with normonatremia (53 years) or hypernatraemia (53 years); $p < 0.01$ in each case.

Discussion

In this study we describe for the first time the prevalence of dysnatraemia in a large group of patients visiting the

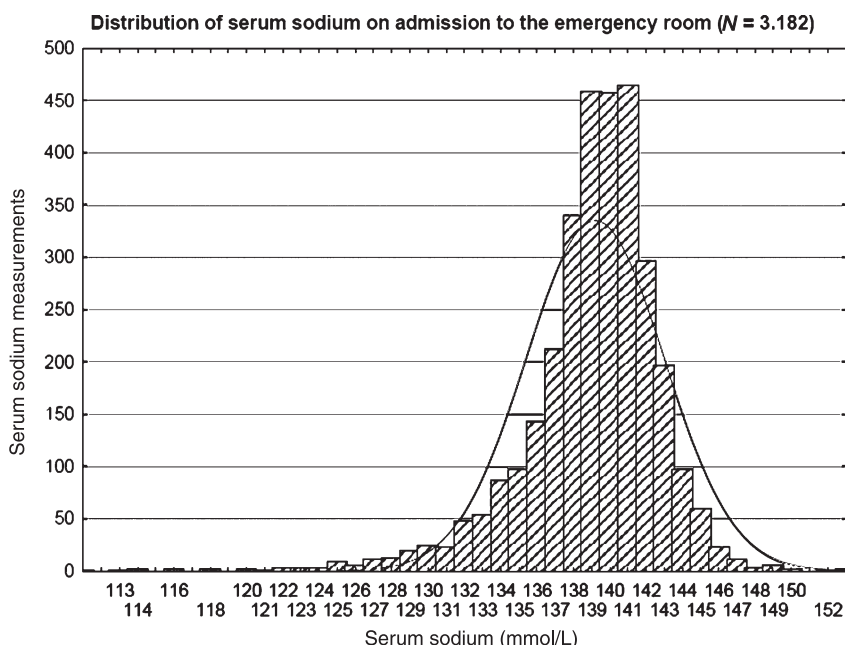


Fig. 1. Distribution of serum sodium on admission to the emergency room over three months (N = 3.182)

emergency room of a large tertiary care hospital in Europe. Hypernatraemia was much more common than hyponatraemia (13% versus 4% of total patients).

Dysnatraemias have been identified as the most common electrolyte disorders in hospitalized patients [12, 20]. Hypernatraemia is a common occurrence in the critical care setting because most patients are unconscious, intubated or sedated and frequently have no free access to water [13, 14]. However, hyponatraemia is also commonly observed in critically ill patients. Pain, medication and central nervous system damage due to trauma, surgery or bleeding often lead to inadequate vasopressin secretion, with consequent retention of free water [20, 21]. This might explain the high incidence of hyponatraemia reported in ICU patients [15, 16].

All of the above possible causes of hypo- and hypernatraemia may apply to emergency room patients. However, so far, only one study in Taiwan has investigated the prevalence of hyponatraemia in an emergency room [19]. As in the present study, Lee et al. described a prevalence of hyponatraemia (defined as a serum sodium <134 mmol/L) of 4%. The authors also found that mortality increased with decreasing serum sodium levels. Interestingly, hypernatraemia was far more common than hyponatraemia in patients admitted to the ICU, although it was mild in most cases.

Hypernatraemia is generally described as a problem of the elderly who live in nursing homes and have no free access to water, or a reduced sensation of thirst and thus a reduction in water intake [22, 23].

However, in the present study, while there was no difference in age between patients with normal serum sodium values and patients with hypernatraemia, hyponatraemic patients were significantly older. This might be explained by the increasing use of diuretics in an aging population: thiazide diuretics have been considered responsible for a significant number of cases of hyponatraemia in an ambulatory setting beside neurological reasons [24–26].

Our study, though limited by its retrospective design, can be considered a pilot study to estimate the incidence of patients presenting with dysnatraemia in the emergency room of a large university hospital.

In conclusion, hypo- and hypernatraemia are common in the emergency room. Interestingly, hypernatraemia was much more common (13%) than hyponatraemia (4%) and patients with hyponatraemia were significantly older than patients with normo- or hypernatraemia. Future studies should focus on the aetiology of hypo- and hypernatraemia in these patients and on plans for their management.

Conflict of interest

None of the authors has a conflict of interest.

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