

Dysnatremia and Mortality in Surgical ICU Patients

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Abstract

Aims: The aim of this study was to investigate association of mortality with the serum sodium level in surgical patients. *Methods:* The study was a prospective, observational study, conducted on the 167 patients admitted in Surgical ICU over a period of eighteen months (January 2014 - June 2015) in Department of Surgery, Mathura Das Mathur Hospital attached to Dr. S. N. Medical College, Jodhpur. Serum sodium values were analysed at admission, at 24 hours, at 72 hours, at the time of shifting to ward in survivors and before death in nonsurvivors. *Results:* At admission, hyponatremia was present in 8.4%, and hypernatremia in only 0.6% patients. During ICU stay, the prevalence of hypo- and hypernatremia increased. In nonsurvivors, before death, hyponatremia was seen in 21.5% and hypernatremia in 8.6% patients. *Conclusion:* In surgical ICU, mortality was shown to have a U-shaped relationship with serum sodium. Both hyponatremia and hypernatremia are independently associated with high mortality in surgical ICU patients. Further studies are needed to find if this association is causal or merely a reflection of differences in severity of illness.

Keywords: Hyponatremia; Hypernatremia; Surgical ICU; Mortality.

Introduction

Fluid and electrolytes disturbances are among the

most common clinical problems encountered in the intensive care unit (ICU). Critical disorders such as severe burns, trauma, sepsis, brain damage, and heart failure lead to disturbances in fluid and electrolyte homeostasis. Sodium and Potassium are the most important body cations, the improper adjustment of them will cause severe disorders. Mild form of hyponatremia and hypernatremia are not problematic, but hyponatremia is of more concern than hypernatremia [1].

Signs and symptoms of hyponatremia are dependent on the degree of hyponatremia and the rapidity with which it occurs. Clinical manifestations primarily are related to central nervous system [2].

Symptoms of hypernatremia are related to hyperosmolarity, central nervous system effects predominate & range from restlessness and irritability to seizures, coma, and death [2].

Materials and Methods

The present study is a prospective observational study conducted on the patients admitted in Surgical ICU over a period of eighteen months (January 2014 - June 2015) in Department of Surgery, Mathura Das Mathur Hospital attached to Dr. S. N. Medical College, Jodhpur.

All patients admitted in the surgical ICU were selected. The study group was informed regarding the aim of study and informed consent was taken.

Serum sodium values were noted at different times (at the time of admission in ICU, after 24 hours, after 48 hours, after 72 hours and at the time of shifting to general ward in survivors and before death in expired patients). Serum sodium < 135 meq/L was considered

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as hyponatremia and > 145 meq/L as hypernatremia. hyponatremia was further divided into mild(130-134), moderate(120-129), severe (<120). Serum sodium levels were compared in survivors and nonsurvivors.

The data of all patients was collected on prepared proforma and was analysed by using appropriate statistical tests. In all analysis a p value of 0.05 was considered to represent a statistically significant difference.

Results

The study included 167 patients, admitted with various surgical conditions in Surgical ICU. Of the total patients, 44.3% survived and 55.7% expired. At admission, hyponatremia was present in 8.4% of

patients and hypernatremia in 0.6% of patients. During ICU stay, the prevalence of hypo- and hypernatremia increased. Hyponatremia was seen in 5.4% ($n = 74$) of survivors at the time of shifting to ward and in 21.5% ($n = 93$) of nonsurvivors before death. Hypernatremia was present in 8.6% of patients before death in nonsurvivors (Table 1). There was no hypernatremia in survivors at the time of shifting to ward (Figure 1). Severe hyponatremia was seen only after 48 hours of ICU admission. In survivors, hyponatremia was mild and moderate in ICU and at the time of shifting to ward, only mild hyponatremia was seen in 5.4%. Severe hyponatremia was not seen in survivors. In nonsurvivors, before death, hyponatremia was mild in 3.2%, moderate in 14% and severe in 4.3% of patients (Table 2). Mortality rate was high in patients with moderate & severe hyponatremia and hypernatremia($P<0.05$).

Table 1: Serum sodium levels in surgical ICU

	Normal	Hypernatremia	Hyponatremia
At admission	152 (91%)	01 (0.6%)	14 (8.4%)
24 hours	145 (86.4%)	04 (2.4%)	15 (9.1%)
48 hours	105 (76.1%)	09 (6.5%)	24 (17.4%)
72 hours	84 (69.4%)	09 (7.5%)	28 (23.1%)
At the time of shifting to ward	70 (94.6%)	00	4 (5.4%)
Before death	65 (69.9%)	09 (8.6%)	20 (21.5%)

Table 2: Hyponatremia in surgical ICU

	Mild	Moderate	Severe
At Admission	06 (3.6%)	08 (4.8%)	00
At 24 Hours	01 (1.2%)	13 (7.9%)	00
At 48 Hours	10 (7.2%)	12 (8.6%)	02 (1.4%)
At 72 Hours	15 (12%)	10 (8.3%)	03 (2.5%)
At the time of shifting to ward	04 (5.4%)	00	00
Before death	03 (3.2%)	13 (14%)	04 (4.3%)

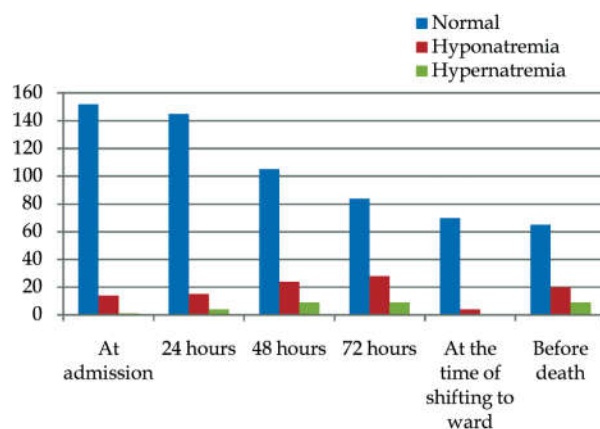


Fig. 1: Serum sodium levels in ICU

Discussion

We found that hyponatremia and hypernatremia in surgical ICU patients are associated with

significantly increased ICU mortality. Our observations are in accordance with prior experimental studies showing adverse effects of dysnatremia. In previously published studies, mortality has ranged from 6.7 to 51% among hospitalised patients with dysnatremia [3-5]. In our study, the mortality rate for patients with hyponatremia was 21.5% and with hypernatremia was 8.6%.

Previously reported case series have emphasised that mortality rate increases as the severity of hyponatremia worsen [6,7]. In our study, mortality rate was highest with moderate hyponatremia (14%) compared to mild (3.2%) and severe hyponatremia (4.3%).

Arguing against a causal effect of hyponatremia was a recent study in hospitalized patients in whom the authors could link fatalities associated with severe hyponatremia (<120 mEq/L) to more severe

underlying disease processes rather than the hyponatremia itself [8]. Nevertheless, observational studies cannot completely overcome the problem of residual confounding, which can be better addressed by randomized controlled trials.

Conclusions

Both hyponatremia and hypernatremia are associated with increased mortality in surgical ICU patients.

Further studies are necessary to find out whether the association between outcome and dysnatremia is causal and association is independent of comorbid conditions and severity of disease.

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