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Comparative study of serum electrolytes in burn patients and healthy individual

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Abstract

Aim & Objectives: Our aim is to study the alterations in serum electrolytes of burn patients for early diagnosis, treatment and to prevent the deaths.

Materials And Methods: Our study included 50 burn patients and 50 healthy individuals of different age and sex group. The analysis of serum electrolytes was done with the help of Biochemistry department by Arterial Blood Gas (ABG).

Results: In the study Mean of Serum Sodium and Chloride level was lower in burn patients than controls ($P < 0.001$) and Serum Potassium level was higher in Burn patients than controls ($P < 0.001$).

Conclusion: The incidence of burn injury and mortality rate is higher in our country; therefore, we study the alterations and prognostic importance of serum electrolytes in the patients of burn injury.

Keywords: ISE- Ion Selective Electrode, ABG- Arterial Blood Gas Analyzer, Na^+ - Sodium, K^+- Potassium, Cl^-- Chloride.

Introduction

Burn injuries are the most devastating injuries impacting a major global public health crisis.[1,2] Burns are the fourth most common type of trauma world-wide.[3] Hypovolemic shock is one of the main cause of mortality, if local and systemic treatments are not provided timely.[4] In rural India, high mortality in young married women from burns has become an alarming medical problem.[5] There has been many medical advances, but burns are, still, a challenging problem due to the lack of infrastructure, lack of trained professionals and increased cost of treatment.[6] Burn injury destroys the water vapor barrier of the skin, thus water loss from the burn surface is markedly elevated.[7] Burn injury lowers the plasma sodium and usually remains decreased in the shock stage and often during most the hyper metabolic stage of burn. The patients usually receive large sodium loads during resuscitation and may be positive sodium balance. At the same time patients show intense renal conservation of sodium during the shock stage and some of the hyper metabolic stage. It is possible that, this is the result ofloss of sodium from the increased extracellular volume into the cells as a result of sodium pump activity impairment caused either by poor circulatory function leading to lowered tissue perfusion or to energy deficit. The conservation of sodium is usually accompanied by increased loss of potassium in urine; plasma levels may be slightly elevated but are rarely above the upper limits of the reference normal range. Increased potassium loss is probably mediated by the adrenal cortex, due to the effect of aldosterone secreted by adrenal cortex,

although it appears likely that loss as a result heat damage to tissue and potassium losses. Excess potassium may also be excreted during the hyper metabolic phase, because muscle is catabolized.[8]

Material and Methods

The present study was carried out in the department of General Surgery, M.Y. Hospital and M.G.M. Medical College, Indore, during October 2021 to May 2022. The study included 200 patients of different age groups, of which 100 are burn patients and 100 are healthy individuals.

Sample collection: The blood is drawn from the radial artery. Our aim is to study serum electrolytes in burn patients as serum electrolytes data can be helpful to make the right decision about management of burn patients. Separated serum is taken in a 1 ml syringe and used for the measurement of serum electrolytes by the Biochemistry department.

Distribution of Study Subjects

Group I	N = 100 Burn patients.
Group II	N = 100 Healthy controls.

Results

Table 1: The mean value of serum electrolytes in burn patients and controls.

Parameters	Patients (N=100) Mean ±SD	Controls (N=100) Mean ±SD	Significance
Na^+ mmol/L	125.30 ± 3.36	138.62 ± 2.39	P < 0.001
K^+ mmol/L	6.370 ± 0.479	4.04 ± 0.433	P < 0.001
Cl^- mmol/L	71.25 ± 8.46	102.82 ± 3.32	P < 0.001

The statistical method uses to compare data was 't' test.

*P> 0.05……Not Significant

**P<0.05… Significant

***P<0.001… Highly Significant

There is highly statistically significant difference in means of Na^+, K^+, Cl^- (P < 0.001) as compare to controls.

In the present study Mean value of biochemical parameters i.e. serum Na^+, Cl^- was significantly decreased, whereas serum K^+ level was significantly increased in burn patients as compared to control.

Discussion

Burn affects all ages, from infants to elderly people, and is a problem in both the developed and developing countries.[9]

Developing countries have a high incidence of burn injuries reasons being high population density, illiteracy, and poverty.[10] Burns on > 10 % of the total body surface area can result in very severe fluid volume abnormalities and electrolyte changes leading to vital risk.[11] Burn injury affects skin integrity and protection against fluid loss.[12] Severe burn injuries induce capillary leak characterized by fluid deregulation and electrolyte imbalance.[12,13] There is an increase in vascular permeability, increase in interstitial osmotic pressure and cellular oedema, leading to loss of intravascular volume. Hyponatremia (<135 mEq/L) is due to extracellular sodium depletion due to changes in cellular permeability. It is quite frequent and so the restoration of sodium loss in the burn tissue is important.[14] Thus, measurement of serum sodium is not only a means of diagnosing dehydration, but it is a good guide for estimation and management of ongoing fluid loss.

In present study, we observed decreased values of serum sodium and chloride (p< 0.001) as compared to controls, whereas increase was observed in serum potassiumlevel when compared to controls (p< 0.001), both are highly significant. Similar results were seen in RA, Hussien MM (1987) who also observed hyponatremia and hyperkalemia in two burn victims.[15] Another study conducted by Kamoi. K, Soda S. et al (2004) suggested that in thermal burn injury the patient admitted was

dehydrated, which was evidenced by physical signs. The patient had hyponatremia with high excretion of urinary sodium.[16] Same results were seen by A. V. Pogosava (1965).[17] Recently a study done byPriyank udagani et al observed that, the patients with thermal injury showed slightly decreased serum sodium and chloride levels and increased potassium levels in burn patients as compared with controls.[18] In another 2 studies conducted by, Hauhout- Attoungbre ML, Mlan W. et al (2005) and Navarini A. Montanari A, et al (1982) observed the elevation of potassium, decrease in sodium and moderate variations in chloride and magnesium in thermal burns.[19, 20]

Conclusion

There is a transdermal fluid loss in burn wounds after severe burn injuries. Serumsodium concentration can be used to calculate the need of fluid resuscitation for fluid maintenance. There is aneed of a well-established fluid removal technique in severely burned patients to avoid water electrolyte imbalance.

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