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Hypoproteinemia, Hypocalcemia, Hyponatraemia, Hyperkalaemia and Trace Elements in Patients with Burn Injuries

Plastic Surgery

KEYWORDS : Hypoproteinemia, Hypocalcemia, Hyponatraemia, Hyperkalaemia, Trace Elements, Burn Injuries

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ABSTRACT

The present study illustrates the changes in total proteins, electrolytes and trace elements in serum of patients with burn injuries. The levels of these substances are very important in diagnosis and the therapy of the patients. A total of 65 patients and 100 healthy controls were enrolled in this study. These patients were admitted to the burns ward at Owaisi Hospital & Research Centre, a teaching hospital to Deccan College of Medical Sciences, Hyderabad, Telangana State, India with 25 – 30 % degree of burn. They were suffering from second to third degree (flame and scald) burn injury. The results showed a statistically significant decrease in levels of serum total proteins, calcium, sodium, copper and zinc where as serum potassium levels were significantly increased in burn injuries.

Introduction:

Serum total proteins are the essential substances to carry the vital functions of the human body. They keep the body in the homeostatic condition. They are also the stored food supplements to carry the vital functions of the body. In post burn cases the serum proteins and calcium levels are decreased this condition is known as hypoproteinemia and hypocalcaemia [5,6,7] Serum calcium plays an important role in the vital functions. There is close relationship between serum total proteins, calcium, vitamin D and magnesium. Serum sodium, potassium and calcium are blood electrolytes. They maintain osmolality, osmotic pressure and acid base balance in the body. Their vital functions are affected after burn injuries [1,2]. The serum sodium significantly decrease hyponatraenemia. The increase serum potassium Hyperkalaemia is well recognized after burns due to combination of the effect of adrenaline and insulin [3,4].

The trace elements are incorporated into structure of proteins, enzymes and complex carbohydrates. Zinc and copper are active in metabolic and biochemical processes in the recovery phase of the wounds. In burn injuries there is an increase in metabolic processes such as tissue repair, wound healing, microcirculation and oxygenation [8,9].

The present study aimed to

- Estimation of serum total proteins
- Estimations of serum calcium (Ca^{++})
- Estimation of serum sodium (Na^{+})
- Estimation serum potassium (K^{+})
- Estimations of serum zinc and copper (Cu^{++}, Zn^{++})

Materials and Methods:

- The collection of blood samples was done in burns ward in Owaisi Hospital & Research Centre a teaching hospital to Deccan College of Medical Sciences, Hyderabad, Telangana, India by using aseptic procedures. The clinical chemistry method was used for estimations of serum total proteins, calcium, zinc and copper were measured by Spectrophotometry in Cobas (C311 & Roche). The serum sodium and serum potassium were analysed by using ST – 200 Plus Electrolyte Analyser .
- Statistical analysis: All values were expressed as mean ± SD and p value was taken <0.05 as the lowest limit of significance. [10]

Results:

Serum total proteins levels are decreased in burn injuries patients in comparison with controls.

Serum calcium levels are decreased in burn injuries patients in comparison with controls.

Serum zinc and copper levels are decreased in burn injuries patients with comparison with controls.

Serum sodium level is decreased in burn injuries patients with comparison with controls.

Serum potassium level is increased in burn injuries patients with comparison with controls.

Discussion:

The serum total proteins of burn patients were significantly decrease in comparison with healthy controls. This condition is known as hypoproteinemia which affects the vital functions of the body. The serum calcium level decreases along with the serum total proteins in binding with serum total protein – calcium complex. The decrease of serum calcium level in burns patients is known as hypocalcemia. These deficiencies of serum total proteins and serum calcium as carrier proteins affect the metabolism of the human body. There is decreased in serum calcium because vitamin D metabolism is disturbed after burn injury. Vitamin D is essential for calcium and phosphorus homeostasis and skeletal bone integrity [17,18]. It may be result of change in calcium protein binding due to change in blood pH, elevation of fatty acids, sepsis, hypoproteinemia, renal failure and hypomagnesaemia [19]. The serum sodium of burn patients was significantly decrease in comparison with healthy controls. The hyponatraenemia in these cases results from sodium deficit from excess water retention and entry of sodium into cells [11] These changes may occur in patients with

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reverse blood transfusion by insulin and glucose infusion [12,13,14]. The serum potassium was significantly increased patients with major burn injuries in comparison with healthy controls. The hyperkalaemia is due to massive tissue necrosis [15]. The serum potassium ions will increase if severe hemolysis has occurred or renal impairment is present [16]. The results of copper, zinc were significantly decreased in comparison with healthy controls [20,21,22] irrespectively of etiology, the serum trace element levels were lower in the burns patients than the healthy individuals.

Table 1
The serum total proteins and serum calcium levels in burn injuries patients and controls

Parameters	Patients	Controls
Serum Total Proteins (grams/dl)	5.8	7.8
Serum Albumin (grams/dl)	2.5	4.2
Serum Globulin (grams/dl)	3.3	3.6
A/G Ratio	0.75	1.66
Serum Calcium (milligrams/dl)	6.2	10.5
C/A Ratio	2.48	2.50

Values are ±SD (p<0.01)
(p<0.02)

Table 2
The serum sodium and serum levels in burn injuries patients

	Patients	Controls
Serum Sodium (mEq/L)	118	140
Serum Potassium (mEq/L)	5.8	4.0

Values are mean ± SD (p<0.001)

Table 3
The serum trace elements levels in burn injuries patients and controls.

The serum trace elements levels in burn injuries patients and controls.

	Patients	Controls
Serum Copper (part per million)	0.0554	0.0666
Serum Zinc (part per million)	0.0278	0.0846

Values are mean ± SD (p < 0.01)
(p < 0.02)

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