

## Original research article

**A retrospective assessment of alterations in serum potassium levels during postoperative exploratory laparotomy****Dr.Ashoka Nand Thakur****Assistant Professor, Department of Paediatrics surgery, Patna Medical College and Hospital, Patna Bihar, India****Corresponding Author: Dr.Ashoka Nand Thakur****Abstract**

**Background:** Any type of surgical trauma whether elective or emergency causes various effects on the human body including a great impact on the physiology of fluid and electrolytes within the body. Mortality and morbidity is very common due to the fluid imbalance after major surgical trauma.

**Aim:** the aim of this study was to assessment of alterations in serum potassium levels during postoperative exploratory laparotomy.

**Materials and methods:** This is a retrospective study conducted in the Department of Paediatrics surgery Patna Medical College and Hospital, Patna, Bihar, India and Sushrut Child Surgery Centre, Patna, Bihar from January 2016 to January 2020.. A total of 50 patients who underwent explorative laparotomy were include in this study. Collection of 2 cc of blood volume was done at preoperative time, one the day of surgery and on postoperative days of surgery. All the samples were sent to laboratory where autoanalyzer was used for assessment of serum potassium levels.

**Results:** Mean age of the patients was 16.7 years. 70 percent of the patients were males while the remaining were females. Mean potassium levels at Baseline (before starting of surgery), One day after surgery, Three days after surgery and Seven days after surgery were found to be 4.85 mEq/L, 5.24 mEq/L, 4.41 mEq/L and 4.32 mEq/L respectively. A significant reduction in the potassium levels during the initial postoperative phase was seen followed by a significant rise; thereby returning to normal value 1 week postoperatively.

**Conclusion:** we concluded that the significant rise in the potassium levels occur after exploratory laparotomy, followed by restoration to normal values by the end of first postoperative week.

**Keywords:** Potassium, exploratory, laparotomy

**Introduction**

The charged substances that result when a salt is dissolved in solution are called electrolytes.<sup>1</sup> There are many electrolytes in serum. These serum electrolytes are involved in various activities essential for life, including nerve transmission, energy production, PH balance, muscle contractions, fluid balance and many others. Sodium, potassium and chloride are widely distributed ions in body fluids. They are major electrolytes, where their concentrations are closely regulated, important in acid base balance, electrolyte balance, substrate transport and osmotic balance.<sup>2</sup> Osmolar concentrations in between extracellular and intracellular compartments are regulated by movement of the solutes and/or body water. Changes in solute concentrations such as Na<sup>+</sup> and glucose that do not move freely across membranes will cause water to move intraspatially from intracellular to extracellular in order to equilibrate the solute concentrations. Osmolality, thus, depends on the solute concentrations. Emergency and elective surgery, trauma, sepsis, feeding, fasting, and an aesthesia all affect the electrolyte balance.<sup>3</sup> Stress response to surgery is characterized by increase in the secretion of pituitary

hormones and the activation of sympathetic nervous system.<sup>4</sup> In order to maintain isotonicity, circulating intravascular volume, and adequate oxygen-carrying capacity, Postoperative fluid balance is important. Fluid balance involves giving fluids appropriately based on the individual patient's needs and giving enough fluids. The intravenous fluid requirement in child up to 10 kg body weight is 100ml/kg/hr. From 10 to 20 kg weight is 1000ml plus 50 /ml/kg/hr and between 20 to 30 kg body weight is 1500ml plus 20 ml/kg/hr. Other fluid loss through ryle's tube is replaced by Ringer Lactate. Target urine out is 2-3 ml/kg/hr. Total fluid loss in the average adult is about 2500 mL/day. This includes 100–200 mL/day through the gastrointestinal tract, insensible fluid losses (through the lungs and skin) of about 500–1000 mL/day, and urine output of about 1000 mL/day. The fluid volume required, therefore, is generally about 2500 mL/day for a 70-kg adult, with Na<sup>+</sup> of 30 mEq/L and K<sup>+</sup> of 15–20 mEq/L.<sup>5</sup> The fluids available are colloids, crystalloids, blood and blood products. In general, crystalloids containing electrolytes found in plasma are administered. Blood and/or blood products might be required depending on the degree of blood loss.<sup>5</sup> Fluid and electrolyte imbalances may occur rapidly in the surgical patient, and can be caused by numerous factors, including preoperative fluid and food restrictions, intra-operative fluid loss, or the stress of surgery.<sup>6</sup> Any type of surgical trauma, whether elective or emergency, causes various effects on the human body including a great impact on the physiology of fluid and electrolytes within the body.<sup>7</sup> Post-operative potassium metabolism has long been the focus of research. Numerous studies have demonstrated that hypokalemia is an independent risk factor for post-operative complications. In clinical settings, pre-existing hypokalemia is frequently detected via initial serum potassium measurement at hospital admission, which usually results in considerable delay of elective laparotomy. Hence; the present study was conducted for assessing the alterations in serum potassium levels during post op exploratory laparotomy.

### **Materials and methods**

This is a retrospective study conducted in the Department of Paediatrics surgery Patna Medical College and Hospital, Patna, Bihar, India and Sushrut Child Surgery Centre, Patna, Bihar from January 2016 to January 2020.

#### **Inclusion criteria**

- A total of 50 patients who underwent explorative laparotomy

#### **Exclusion criteria**

- Hypertensive patients
- Diabetic patients
- Patients with history of any other systemic illness

#### **Methodology**

Complete demographic and clinical details of all the patients were recorded. A Performa was made and all the relevant data of all the subjects was recorded. Physical and general examination of all the patients was done. Collection of 2 cc of blood volume was done at preoperative time, one the day of surgery and on postoperative days of surgery. All the samples were sent to laboratory where autoanalyzer was used for assessment of serum potassium levels. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software.

### **Results**

In the present study, a total of 50 patients who underwent exploratory laparotomy were include. Mean age of the patients was 16.7 years. 70 percent of the patients were males while the remaining were females. Mean potassium levels at Baseline (before starting of surgery), One day after surgery, Three days after surgery and Seven days after surgery were found to

be 4.85 mEq/L, 5.24 mEq/L, 4.41 mEq/L and 4.32 mEq/L respectively. A significant reduction in the potassium levels during the initial postoperative phase was seen followed by a significant rise; thereby returning to normal value 1 week postoperatively.

**Table 1: Demographic distribution of patients**

Sex	No. of patients =50	Percentage
Male	35	70
Female	15	30
Age year		
Below 5	4	8
5-10	11	22
10-15	19	38
15-18	16	32
Area		
Rural	33	66
Urban	17	34

**Table 2: Mean potassium levels**

Parameter	Mean potassium levels
Baseline (before starting of surgery)	4.85 mEq/L
One day after surgery	5.24 mEq/L
Three day after surgery	4.41 mEq/L
Seven day after surgery	4.32 mEq/L

**Table 3: Comparison of potassium levels**

Group Versus Group	t-value	p- value	
Baseline	One day after surgery	-1.805	0.00*
	Three days after surgery	-1.507	0.01*
	Seven days after surgery	-2.645	0.02*
One day after surgery	Three days after surgery	-3.132	0.03*
	Seven days after surgery	-1.441	0.00*
Three days after surgery	Seven days after surgery	2.779	0.84

### Discussion

Patients undergoing abdominal surgery develop episodes of impaired gastrointestinal motility and even postoperative ileus. Prolonged gastrointestinal paralysis after surgery may result in longer hospital stays and increased medical costs. Electrolyte homeostasis, particularly the blood potassium level, is very important for postoperative recovery of gastrointestinal function. Several studies suggested that hypokalemia was an independent risk factor for postoperative complications, including delayed recovery of gastrointestinal motility, while sufficient potassium supplementation might accelerate recovery of gastrointestinal function.<sup>8,9</sup> Hence; the present study was conducted for assessing the alterations in serum potassium levels during post op exploratory laparotomy. In the present study, a total of 50 patients who underwent exploratory laparotomy were included. Mean age of the patients was 16.7 years. 70 percent of the patients were males while the remaining were females. Mean potassium levels at Baseline (before starting of surgery), One day after surgery, Three days after surgery and Seven days after surgery were found to be 4.85 mEq/L, 5.24 mEq/L, 4.41 mEq/L and 4.32 mEq/L respectively. A significant reduction in the potassium levels during

the initial postoperative phase was seen followed by a significant rise; thereby returning to normal value 1 week postoperatively.

Variable results have been reported in past literature in this context. Guanzhen Lu et al. evaluated the significance of pre-hospital and post-operative serum potassium level monitoring and hypokalemia intervention in laparotomy patients with hypokalemia. A total of 118 laparotomy patients with hypokalemia were randomly divided into an intervention group (N = 60) and a control group (N = 58). Average serum potassium levels at admission, time period of drinking, and time of first bowel sound after laparotomy differed significantly ( $p < 0.001$ ) between the two groups. Average serum potassium levels, first time of defecation, urination, and ambulation at 24 h and 48 h post-operation differed significantly ( $p < 0.05$ ) between the two groups. An optimal pathway of serum potassium monitoring not only saves limited ward space but also allows for early correction of hypokalemia in patients undergoing laparotomy.<sup>10</sup> There was no significant difference observed in the serum electrolyte levels by Maria valadao et al. (2015), and Keshab et al. (2014), whereas the studies of Shenqi et al. (2013), and Kumkum et al. (2010), Krishnamoorthy & Shobha (2002) reported an increase in the serum potassium levels post operatively.<sup>8,9,11-13</sup> Blood potassium levels could differ slightly among individuals and were very important during perioperative management of patients undergoing abdominal surgery. Abdominal surgery is a main category of general surgery, and, furthermore, the effects of postoperative potassium metabolism in patients are always a concern for physicians. The first measurement of the serum potassium level after admission to the hospital shows that many patients had had hypokalemia before, which could not be explained by common causes such as inadequate intake or excessive loss of potassium. With the development of economy, improvement of living standards, increase in work pressure, and changes in lifestyle, the primary disease spectrum has altered greatly, resulting in hypertension and diabetes mellitus (DM) becoming very common conditions.<sup>14-17</sup> In the present study, a significant reduction in the potassium levels during the initial postoperative phase was seen followed by a significant rise; thereby returning to normal value 1 week postoperatively. Our results were in concordance with the results obtained by previous authors. Nausheen N et al. studied serum electrolyte changes in post-operative cases (patients undergoing Explorative Laparotomy) and to study which serum electrolyte is markedly changed in post-operative patients. Their study showed significant changes in serum electrolyte in postoperative period.<sup>18</sup>

### Conclusion

We concluded that the significant rise in the potassium levels occur after exploratory laparotomy, followed by restoration to normal values by the end of first postoperative week.

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