

# A Study of Peri-Operative Changes in Serum Potassium Levels in Patients Undergoing Exploratory Laparotomy

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**Abstract:** *Background:* Electrolyte imbalance is a common physiological response following major abdominal surgery. Among electrolytes, potassium plays a pivotal role in neuromuscular, cardiac, and gastrointestinal function [1]. *Aim:* To analyse peri-operative trends in serum potassium levels among patients undergoing exploratory laparotomy. *Materials and Methods:* A prospective observational study was conducted on 57 patients undergoing exploratory laparotomy. Serum potassium levels were measured preoperatively and on postoperative days 1, 3, and 5 using an automated analyser. *Results:* Mean serum potassium levels showed a transient rise on postoperative day 1, followed by gradual normalisation by day 5. These changes were statistically significant ( $p < 0.05$ ). *Conclusion:* Exploratory laparotomy results in a temporary but significant fluctuation in potassium, underscoring the importance of routine monitoring.

**Keywords:** Serum Potassium, Exploratory Laparotomy, Peri-operative, Electrolyte Imbalance

## 1. Introduction

Exploratory laparotomy continues to be one of the most frequently performed major abdominal surgical procedures in general surgery, both in elective and emergency settings. Despite advances in surgical techniques, anaesthesia, and peri-operative care, postoperative metabolic and electrolyte disturbances remain common and clinically significant. Among the various electrolytes, potassium occupies a central role due to its critical involvement in cellular metabolism, neuromuscular excitability, cardiac conduction, and gastrointestinal motility [1], [3].

The physiological stress response to surgery is characterised by the activation of the sympathetic nervous system and the release of stress hormones, including catecholamines, cortisol, and aldosterone [2]. These hormonal changes, along with peri-operative fasting, fluid shifts, blood loss, tissue injury, and intravenous fluid administration, can significantly influence potassium homeostasis [6]. Even subtle deviations in serum potassium levels may result in clinically relevant complications, including paralytic ileus, muscle weakness, delayed wound healing, and potentially life-threatening cardiac arrhythmias [1], [9].

Postoperative potassium imbalance is particularly important in abdominal surgery, where gastrointestinal function plays a major role in recovery. Hypokalemia has been identified as an independent risk factor for delayed return of bowel activity, while hyperkalemia may predispose patients to cardiac complications [4], [11]. Despite this, peri-operative

potassium fluctuations often receive less attention than sodium disturbances, and routine monitoring practices may vary widely across institutions [7].

Understanding the pattern of potassium changes following exploratory laparotomy is essential for optimising peri-operative management, guiding fluid and electrolyte therapy, and preventing avoidable complications. The present study was therefore undertaken to evaluate peri-operative variations in serum potassium levels in patients undergoing exploratory laparotomy and to observe the trend of normalisation during the early postoperative period.

## 2. Materials and Methods

This is a prospective observational study conducted between January 2025 till December 2025 enrolling 57 adult patients undergoing either emergency or elective exploratory laparotomy. Patients with renal disease, diabetes mellitus, hypertension, those on potassium-altering drugs and patients in the paediatric age group were excluded. Complete demographic and clinical details of the patients were compiled along with a thorough general physical examination, radiological and blood investigations and pre-anaesthetic check-up.

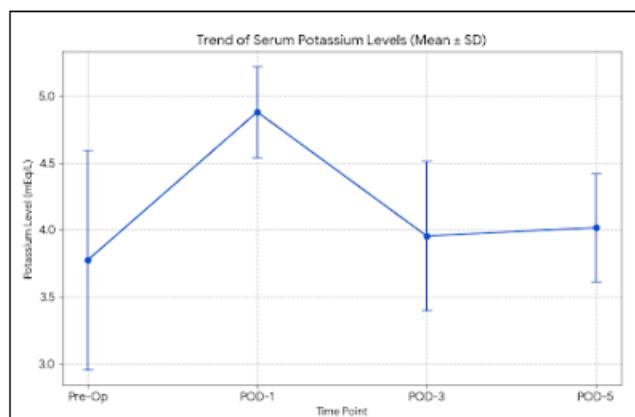
Blood samples were collected preoperatively and on postoperative days 1, 3, and 5. Serum potassium was analysed using an automated analyser. The data collected was recorded in Microsoft Excel and statistically evaluated using SPSS software.

**Table 1: Demographics of enrolled patients**

Characteristic	Value
Sample Size (n)	57
Age (Years) Mean $\pm$ SD	52.17 $\pm$ 14.97
Age Range (Min - Max)	28 - 74
Sex: Male	36 (63.1%)
Sex: Female	14 (36.9%)

### 3. Results

The study population comprised 63% males and 37% females, with a mean age of 52.17 years.

**Figure 1: Trend of Serum Potassium Levels (Mean ± SD)****Table 2: Peri-operative Serum Potassium Levels and Comparative Analysis**

Time Point	Potassium (mEq/L), Mean $\pm$ SD	p-value (vs. Pre-Op)
Pre-Operative (Baseline)	3.77 $\pm$ 0.82	—
Post-Operative Day 1	4.88 $\pm$ 0.34	<0.001*
Post-Operative Day 3	3.96 $\pm$ 0.56	0.543
Post-Operative Day 5	4.02 $\pm$ 0.40	0.334

\*Significant

### 4. Discussion

The present study highlights the dynamic nature of serum potassium levels in patients undergoing exploratory laparotomy. Our findings demonstrate a significant but transient alteration in potassium levels during the early postoperative period, with an initial rise followed by gradual normalisation within one week after surgery. These observations emphasise the importance of vigilant peri-operative electrolyte monitoring in patients undergoing major abdominal procedures.

The immediate postoperative increase in serum potassium levels observed on postoperative day one may be attributed to multiple physiological mechanisms. Surgical trauma leads to cellular injury and increased membrane permeability, resulting in a shift of potassium from the intracellular to the extracellular compartment. Additionally, metabolic acidosis, reduced renal perfusion during surgery, and the effects of anaesthetic agents may contribute to transient hyperkalemia [2],[6]. The stress-induced hormonal response further alters renal handling of electrolytes, influencing potassium balance [2].

As postoperative recovery progresses, restoration of gastrointestinal function, improved renal perfusion, mobilisation of patients, and appropriate fluid management facilitate the gradual normalisation of serum potassium levels [6]. By the end of the first postoperative week, potassium levels in most patients returned to near-baseline values, indicating recovery of physiological homeostasis. This trend underscores the self-limiting nature of postoperative potassium fluctuations when managed appropriately.

Our results are consistent with previously published studies that report significant peri-operative changes in serum potassium levels following abdominal surgery [4],[5]. Several authors have emphasised that both hypokalemia and hyperkalemia can adversely affect postoperative outcomes if not identified and corrected in a timely manner. Delayed detection may result in prolonged ileus, cardiac arrhythmias, increased hospital stay, and higher healthcare costs.

The findings of this study reinforce the clinical relevance of routine serum potassium monitoring, particularly during the early postoperative period. Early identification of abnormal potassium levels allows prompt intervention, including adjustment of intravenous fluids, potassium supplementation, or restriction as required. This proactive approach can significantly reduce postoperative morbidity and improve overall patient outcomes.

However, the present study has certain limitations, including a relatively small sample size and the absence of correlation between potassium levels and specific clinical outcomes such as duration of ileus or length of hospital stay. Future studies with larger sample sizes and outcome-based analysis would provide a more comprehensive understanding of the clinical implications of peri-operative potassium imbalance.

### 5. Clinical Implications

The findings of the present study have important and direct clinical implications for the peri-operative management of patients undergoing exploratory laparotomy. The observed transient but significant alterations in serum potassium levels emphasise that potassium imbalance is not an incidental laboratory finding, but a predictable physiological response to major abdominal surgery.

Routine peri-operative monitoring of serum potassium, particularly during the first 72 hours following surgery, should be considered an essential component of postoperative care. Early identification of abnormal potassium levels allows timely correction, thereby reducing the risk of potentially serious complications such as paralytic ileus, cardiac arrhythmias, muscle weakness, and delayed postoperative recovery.

The study also underscores the importance of tailored fluid and electrolyte therapy rather than uniform fluid administration protocols. Judicious selection of intravenous fluids and careful potassium supplementation based on serial measurements can help maintain electrolyte homeostasis and improve patient outcomes. In elderly patients and those undergoing emergency laparotomy, closer monitoring is

especially warranted due to their reduced physiological reserve and higher susceptibility to electrolyte disturbances. From a surgical recovery perspective, maintaining optimal potassium levels may contribute to earlier return of bowel activity, reduced postoperative morbidity, shorter hospital stay, and overall improvement in quality of postoperative care. Incorporating structured electrolyte monitoring protocols into standard postoperative management pathways can therefore enhance patient safety and reduce healthcare burden.

## 6. Conclusion

Exploratory laparotomy is associated with transient perioperative potassium changes that normalise within one week. Regular monitoring and individualised electrolyte management are recommended.

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