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A STUDY OF SERUM ELECTROLYTES (SODIUM AND POTASSIUM) LEVEL VARIATIONS IN POST-OPERATIVE LAPAROTOMY PATIENTS

General Surgery

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KEYWORDS

Sodium, Potassium, Intra and Post-operative, Laparotomy,

Introduction:
All of us know that sodium and potassium are the two important inorganic electrolytes in human body. Sodium being major electrolyte in extracellular compartment and potassium in intracellular compartment. Sodium is vital for homeostasis and action potential in the body. It control the water movement in and out of the vascular system. Normal range of serum sodium concentration is 135 to 145 mEq/liter. Normal range of serum potassium concentration is 4.5 to 5.5mEq/litter (1).

Electrolytes are important components of body fluid as they play a vital role in cellular function and survival (2). Serum electrolytes and fluid volume changes occur preoperatively, intra-operatively and postoperatively (3). Operative trauma is followed by series of changes referred as metabolic response to injury which is directly proportion to severity of the trauma (4). Post-operative results depends on physiological and biochemical response which into play when surgery distort normal pattern (5).

Aim:
To know the serum electrolytes (sodium and potassium) level changes in postoperative period and impact of the same on the general condition of the patient.

Objectives:
1. To know the influence of sodium and potassium level on the outcome of laparotomy.
2. To reduce the morbidity and mortality associated with serum sodium and potassium level variation.

Materials and Method:
This study was conducted in RCSM Govt. Medical College and CPR Hospital (Tertiary Care Centre), KOLHAPUR, MAHARASHTRA. Study period was 3 months from July 2019 to September 2019 and was prospectively done. We considered all operated laparotomy patients. Preoperative, postoperative day 3, 5 and 7th serum sodium and potassium level were included in the study. We have analysed admissions of three months.

Results:
In the present study, we included a total of 29 patients. Mean age of the patients was 45.03 ± 15.48 years (range 16 to 72 years) with age group of 40 to 60 years being the most common (44.8%). Males comprised 72% of all patients included in the study (Table 1). The most common indications for undergoing surgery were acute intestinal obstruction (24.1%), appendicular perforation (13.4%), ileal perforation (10.3%) and gastric prepyloric perforation (10.3%). Less common indications were perforative peritonitis, cholelithiasis, obstructed inguinal hernia, small bowel gangrene, CBD stones, duodenal perforation, necrotising pancreatitis with ruptured pseudo cyst, polytrauma with Grade 4 Splenic Injury, post LSCS burst abdomen and traumatic jejunal perforation. The most common surgical procedures performed were adhesionolysis (20.7%) and Grahm's Patch repair (17.2%). Other surgical procedures performed were ileo-ileal RA, open appendicectomy, primary closure, appendectomy, CBD exploration, end sigmoid colostomy, exploratory laparotomy, ileo -transverse RA, jejeuno-ileal RA, open cholecystectomy, open necrosectomy, ileo-colic RA and splenectomy. Mean serum sodium level was 140.41 ± 6.18 mEq/l pre-operatively, 140.96 ± 6.78 mEq/l on post-operative day 3, 137.31 ± 25.57 mEq/l on post-operative day 5 and 141.31 ± 8.32 mEq/l on post-operative day 7. We did not observe any significant difference in the level of serum sodium on subsequent post-operative assessments as compared to pre-operative serum sodium levels (Table 2). Mean serum potassium levels was 4.13 ± 0.65 mEq/l pre-operatively, 3.71 ± 0.40 mEq/l on post-operative day 3, 3.81 ± 0.72mEq/l on post-operative day 5 and 3.71 ± 0.52mEq/l on post-operative day 7. When compared with pre-operative levels, serum potassium levels were found to be significantly lower on post-operative assessments (Table 3).

DISCUSSION
Patients with electrolyte imbalances may remain asymptomatic or have nonspecific symptoms such as headaches, lethargy, muscle weakness, intestinal dysmotility, and delirium are frequent (6). In extreme cases, imbalances can also result in life-threatening complications such as cardiac arrhythmias, respiratory depression, seizures, or coma. Enhanced recovery after surgery programs aim to attenuate variability in postoperative care and may minimize complications by promoting early resumption of diet and minimization of intravenous fluids (7). Unfortunately, clinical management of electrolytes is not standardized so as to enhance post-operative recovery. The present study was done to study how serum sodium and potassium are affected in patients who undergo gastrointestinal surgeries. We observed that when compared with pre-operative levels, serum potassium levels were found to be significantly lower on post-operative assessments. For gastrointestinal surgeries, patient preparation include dietary restrictions, cathartic enemas, and colon-cleansing agents, which are used to achieve ideal preparation for both surgery and anaesthesia. Due to use of these agents, perioperative hypokalaemia is a common finding among these patients, which could have an impact on postoperative gastrointestinal function (8). Polyethylene glycol is the most frequently used solutions for bowel preparation pre-operatively. Previous studies have shown that the development of hypokalaemia was a common complication of polyethylene glycol-based preoperative bowel preparation (9). Also, mannitol administration has been associated with the development of hypokalaemia (10). Therefore, use of agents in patient preparation needs careful attention and should be modified according to patient profile, so as to prevent hypokalaemia peri- and post-operatively.

Low serum potassium has been listed as a cause for paralytic ileus, and correcting electrolyte anomalies is one of the first steps in treatment of a patient with non-functioning bowels. However, this seems to be debatable, as recent literature does not support a clear causative link (11). Older studies cite potassium as one of the many factors to optimize to regain bowl function, while newer studies do not support hypokalaemia as a cause of ileus.

We did not observe significant difference in the level of serum sodium on subsequent post-operative assessments as compared to pre-operative serum sodium levels. Leung and colleagues reported that both preoperative hypo- and hypernatremia are independently associated with increased hospital mortality, length of hospital stay, and complications in surgical patients (12). In the multivariate analysis, after adjusting for confounding factors we found a more than three-fold increase in mortality for patients presenting with serum sodium higher than 149mmol litre−1 (OR 3.42) (13). A further possible explanation could relate to other adverse effects of hypernatremia, such as increased peripheral insulin resistance and decreased cardiac contractility. This needs to be investigated further in large multi-

centric studies.

There are a few limitations of the present study. First, because of the limited number of patients, our results need to be confirmed by larger, multi-centre, cohort studies. Second, we could obtain information such as the oral intake of potassium and ambulation status of patients from medical records. Last, the impact of electrolyte disturbances on clinical outcome of the patients in the long term could not ascertained from our dataset.

CONCLUSION

The results of the present demonstrate that a significant decrease in serum potassium level is observed post-operatively among patients who undergo major abdominal surgeries. However, serum sodium levels remained similar in the post-operative period. Further studies are needed which assess the impact of electrolyte disturbance on recovery time, length of stay and long term clinical outcomes of such patients.

Table 1. Baseline characteristics of the patients included in the study

Patient variables	Frequency	Percent
Age group (in years)		
Up to 20	1	3.4
> 20 to 40	11	37.9
> 40 to 60	13	44.8
More than 60	4	13.8
Gender		
Female	8	27.6
Male	21	72.4
Diagnosis		
Cholelithiasis	1	3.4
Ileal Perforation	3	10.3
Obstructed left side Inguinal Hernia	1	3.4
Obstructed Right side Inguinal Hernia	1	3.4
Perforative Peritonits	2	6.9
Small Bowel Gangreen due to SMA thrombosis	1	3.4
Acute Intestinal Obstruction	7	24.1
Appendicular Perforation	4	13.8
CBD Stones (Elective)	1	3.4
Deudenal Perforation (D1)	1	3.4
Gastric Prepyloric Perforation	3	10.3
Necrotising Pancreatitis with ruptured Pseudocyst	1	3.4
Polytrauma with Grade 4 Splenic Injury	1	3.4
Post LSCS Burst Abdomen	1	3.4
Traumatic Jejunal Perforation	1	3.4
Surgery		
Adhesionolysis	6	20.7
Appendicectomy	1	3.4
CBD Exploration	1	3.4
End Sigmoid Colostomy	1	3.4
Exp. Laparatomy	1	3.4
Grahm's Patch repair	5	17.2
Ileo -Transevere RA	1	3.4
Ileo-ileal RA	3	10.3
Jejeuno-ileal RA	1	3.4
Open Appendectomy	3	10.3
Open Cholecystectomy	1	3.4
Open Necrosectomy	1	3.4
Primary Closure	2	6.9
RA (Ileo-colic)	1	3.4
Splenectomy	1	3.4

Table 2. Comparing serum sodium levels pre- and post-operatively

Serum sodium levels	Mean	Std. Deviation	p value
Pre-operative	140.414	6.1835	0.68
Post-operative day 3	140.966	6.7849	
Pre-operative	140.414	6.1835	0.54
Post-operative day 5	137.31	25.5708	
Pre-operative	140.414	6.1835	0.59
Post-operative day 7	141.31	8.3242	

Table 3. Comparing serum potassium levels pre- and post-operatively

Serum potassium levels	Mean	Std. Deviation	p value
Pre-operative	4.1366	0.65941	<0.001
Post-operative day 3	3.7121	0.40521	
Pre-operative	4.1366	0.65941	<0.05
Post-operative day 5	3.809	0.72348	
Pre-operative	4.1366	0.65941	<0.05
Post-operative day 7	3.7186	0.52177	

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