

RESEARCH PAPER

Changes in Serum Electrolytes Following Permanent or Temporary Ileostomy

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Abstract

Background: Patients with ileostomies are well known to be susceptible to extracellular fluid volume depletion as a result of fluid and solute losses that are greater than intake. However, electrolyte disorders accompanying these episodes of volume depletion are not well delineated.

Objective: To find out serum electrolytes changes observed in patients undergone permanent or temporary ileostomy.

Method: This prospective observational study was carried out in the Department of Colorectal Surgery, BSMMU, Dhaka, from January 2018 to December 2018. Fifty patients underwent permanent or temporary ileostomy and postoperatively treated with intravenous fluid and electrolytes at least up to 3rd POD along with gradual resumption of oral intake or ileostomy feeding and managed at least for 5 days were included in this study. Electrolyte was measured preoperatively and 3rd and 5th POD and observed the changes.

Result: Males were predominant than females (1.17:1). Most of the patients were in age group 31 – 40 years. Mean age was 42.4±12.5 years. Serum sodium (Na) and serum potassium (K) were reduced at POD 3 and at POD 5 compared to pre-operative level. Serum sodium concentration was 136.6±3.75 mmol/L pre operatively and reduced to 135.1 ±2.98 mmol/L at 3rd POD and 134.8±3.04 mmol/L at 5th POD. Similarly, serum potassium concentration was 4.0±0.49 mmol/L pre operatively and reduced to 3.8±0.70 mmol/L at 3rd POD and 3.8±0.50 mmol/L at 5th POD. Both serum Na and serum K level reduced significantly in POD 3 and in POD 5 in comparison to pre-operative values ($p<0.05$). Regarding serum Cl and serum HCO₃ level no statistically significant difference were observed ($p>0.05$).

Conclusion: Serum sodium and potassium concentration reduced statistically significantly after permanent ileostomy.

Keywords: Ileostomy, Serum electrolytes, Serum sodium, Serum potassium

Introduction

Ileostomy is derived from Greek words, eilos (twisted bowel) and stoma (mouth), which mean a hole in the twisted part of the ileum.^{1,2} It is the surgical creation of an opening in the ileum through the abdominal wall to allow for preferential drainage of the intestinal contents. For many years salt and water depletion has been recognized as a

complication of the early post-operative period in patients with an ileostomy.

Removal of the colon and construction of an ileostomy invariably results in new challenges for acid-base and electrolyte equilibrium. Even in patients with intact ileums and well-functioning ileostomies, 200 to 1,000 ml of fluid is lost daily, containing 40 to 100 mmol of sodium, 15 to 30 mmol of bicarbonate, and 5 mmol of potassium.³⁻⁵ Most patients adapt to these daily losses through subtle changes in salt and water intake, as well as changes in urine volume and electrolyte and acid excretion, and thereby can

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maintain electrolyte and acid-base equilibrium.³⁻⁶ However, the new equilibrium is fragile, particularly in patients with daily ileostomy drainage of 1 L or greater. These patients often have Crohn disease and may have lost part of the ileum to disease.⁴ Despite the appearance of normality, measurements in apparently healthy patients with ileostomies show a 7% to 11% decrease in total body sodium and water, indicating the presence of stable modest extracellular fluid volume depletion.⁶ Not surprisingly, symptomatic volume depletion is not uncommon, occurring when either ileostomy drainage abruptly increases or dietary intake is disrupted or in the presence of excessive sweating.^{5,6} In newborn infants with ileostomies, both metabolic acidosis and alkalosis have been reported to occur.^{7, 8}

Materials and Methods

This prospective observational study was done in the department of Colorectal Surgery, BSMMU, Dhaka over a period of one year during January-December 2018. Fifty patients of all age groups and both sexes who underwent ileostomy and postoperatively treated with intravenous fluid and electrolytes at least up to 3rd POD along with gradual resumption of oral intake or ileostomy feeding and managed at least for 5 days were included in this study. Patients with known co-morbidities such as renal and respiratory failure, end stage liver disease or patient who did not survive within respective study period (5 days) or patients having uncontrolled diabetes were excluded from the study. After taking proper consent and counseling, subjects were evaluated clinically by amount of stoma output, urine output, routine and special investigation (serum electrolytes: sodium, potassium etc.). Electrolytes were measured preoperatively and 3rd and 5th POD and observed the changes and these data were statistically evaluated and management protocol of this patients. Paired 't' test was used to infer the difference in means. For significance, *p*-value <0.05 was considered as significant.

Results

A total number of 50 patients with ileostomy were recruited in this study. Patients' demography and baseline data were recorded using semi-structured questionnaire (table I).

Table-I: Distribution of the patients according to age in male and female (n=50)

| Age (years) | Male | Female | Total |
|-------------|-----------|-----------|-----------|
| 21 - 30 | 7 (25.9) | 3 (13.0) | 10 (20.0) |
| 31 - 40 | 10 (37.0) | 6 (26.1) | 16 (32.0) |
| 41 - 50 | 4 (14.8) | 6 (26.1) | 10 (20.0) |
| >50 | 6 (22.2) | 8 (34.8) | 14 (28.0) |
| Total | 27 | 23 | 50 |
| Mean ± SD | 40.5±12.6 | 44.6±12.2 | 42.4±12.5 |

SD= Standard deviation

It shows that maximum number of patients were in age group 31 – 40 years. Mean age was 42.4±12.5 years. Males were predominant than females (1.17:1). Most of the patients had cancer (76.0%) (table II).

Table-II: Distribution of the patients according to diagnosis (n=50)

| Diagnosis | Frequency | Percentage |
|--|-----------|------------|
| Ca. ascending colon | 4 | 8.0 |
| GIST with transverse colostomy | 2 | 4.0 |
| Hartmann's reversal | 2 | 4.0 |
| Subacute intestinal obstruction | 2 | 4.0 |
| Carcinoma sigmoid colon | 4 | 8.0 |
| Ca rectum | 23 | 46.0 |
| Low rectal carcinoma | 1 | 2.0 |
| Growth in splenic flexure | 1 | 2.0 |
| Recurrent carcinoma sigmoid colon | 1 | 2.0 |
| Carcinoma transverse colon | 1 | 2.0 |
| Carcinoma caecum with multiple polyps in sigmoid colon | 1 | 2.0 |
| Carcinoma Rectum with Hartman's procedure | 1 | 2.0 |
| FAP | 4 | 8.0 |
| Anorectal abscess | 1 | 2.0 |
| Carcinoma ascending colon | 2 | 4.0 |

Changes of Na, K, CL and HCO₃ levels at POD 3 and POD 5 compared to pre-operative level were also recorded (table III).

Table-III: Electrolytes level of the ileostomy patients (n=50)

| Electrolyte | Pre-operative | POD 3 | POD 5 | Pre vs. POD 3* | Pre vs. POD 5* |
|---------------------------|---------------|---------------|---------------|----------------|----------------|
| Na (mmol/L) | 136.57 ± 3.75 | 135.07 ± 2.98 | 134.85 ± 3.04 | 0.005 | 0.015 |
| K (mmol/L) | 4.02 ± 0.49 | 3.86 ± 0.70 | 3.81 ± 0.50 | 0.046 | 0.007 |
| Cl (mmol/L) | 100.80 ± 3.41 | 100.78 ± 3.12 | 100.67 ± 5.32 | 0.969 | 0.886 |
| HCO ₃ (mmol/L) | 26.28 ± 3.14 | 25.74 ± 2.86 | 26.09 ± 2.89 | 0.175 | 0.756 |

* p-values obtained by paired 't' test

Na=Sodium; K= Potassium; Cl= Chloride; HCO₃= Bicarbonate; POD= Post operative day

Serum sodium concentration was 136.57±3.75 mmol/L pre operatively and reduced to 135.1±2.98 mmol/L at 3rd POD and 134.85±3.04 mmol/L at 5th POD. Similarly, serum potassium concentration was 4.0±0.49 mmol/L pre operatively and reduced to 3.8±0.70 mmol/L at 3rd POD and 3.8±0.50 mmol/L at 5th POD. Serum Cl and Serum HCO₃ levels did not change in POD 3rd or in POD 5th significantly from pre-operative values.

Discussion

Maintenance of normal fluid-electrolyte balance is needed for maintenance of homeostasis of the body. In electrolyte imbalance serum electrolytes are routinely measured. For all practical purposes, serum electrolyte levels along with finding of clinical status were used for clinical management of patient. Usually an excess loss of fluid and/ or electrolytes occurs through gastrointestinal tract, respiration, skin, kidney and other abnormal process of elimination like vomiting, fistulas, and surgically created ostomies like ileostomy and colostomy.

The aim of current study was to find out serum electrolytes changes observed in patients undergone permanent or temporary ileostomy. Fifty patients who underwent ileostomy and postoperatively treated with intravenous fluid and electrolytes were included in the current study. In this study, maximum number of patients were in age group 31 – 40 years. Mean age was 42.4±12.5 years. In a study by Ganguly et al almost similar results were reported.⁹ They found maximum number of patients in age group 25-49 years and mean age was 43.4. In another study mean age of the patients was 42.98 years with the range of 19-75 years.¹⁰

In the current study males were predominant than females (1.17:1). Similar male female ratio was observed in the study of Ganguly et al. (1.5:1).⁹

In this study, serum sodium concentration was 136.5±3.75 mmol/L pre operatively and reduced to 135.1±2.98 mmol/L at 3rd POD and 134.8±3.04 mmol/L at 5th POD. Similarly, serum potassium concentration was 4.0±0.49 mmol/L pre operatively and reduced to 3.8±0.70 mmol/L at 3rd POD and 3.8±0.50 mmol/L at 5th POD. This study revealed a significant decrease in serum sodium and serum potassium concentration postoperatively in patients who underwent ileostomy on 3rd and 5th postoperative days ($p < 0.05$). Similar changes were observed in the study of Songra et al and Ganguly et al Hill et al, Gallagher et al.⁵ and Clarke et al also observed sodium and water depletion in ileostomised patients on early post-operative periods.^{5,6,11}

Conclusion

Based on the study findings, it may be concluded that the serum sodium and serum potassium concentration reduced significantly in POD3 and in POD5 in comparison to pre-operative baseline values. In all patients who undergo ileal resection along with ileostomy should be closely monitored for electrolyte derangement from the 3rd post-operative day onwards so that an optimal electrolytes balance can be maintained.

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