Changes in Serum Sodium and Potassium in Stoma Patients: A prospective observational study

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Abstract*—Stoma may form after intestinal surgeries. Electrolyte imbalance may occur due to stoma. So this study was carried out to find out the changes in Serum Sodium and Serum Potassium level upto 5th post-operative day. Study was conducted on 100 post-operative cases with stoma addimitted in department of Surgery, SMS Medical college, Jaipur (Rajasthan) India. It was observed that patients with high output stoma are more prone to depletion of fluids and electrolytes than low output stoma, so they should be monitored and resuscitated aggressively in early post-operative periods. So it can be concluded that assessment of electrolyte is necessary in patients with these cases in early post-operative period.*

Keywords: Stoma, Serum Sodium, Serum Potassium.

I. INTRODUCTION

Maintenance of normal fluid-electrolyte balance is desirable for maintenance of homeostasis. Electrolyte imbalance may be intra or extra cellular among which serum electrolytes are readily measured. When the amount of stoma effluent is around 500 ml or less, it is low volume stoma. When the volume of stoma effluent is 1 litres, it is a high-volume stoma.[1] Patients with high output stoma are prone to salt and water depletion, especially when there is associated resection of significant length of ileum.[1]

Salt and water depletion has been recognised as a complication of the early postoperative period in patients with an ileostomy. Not much work was done in this respect in our geographical area with extreme climate and great swing in temperature dryness. This compound the problem of such patients due to increase losses of fluid and electrolytes through the skin and lungs. In our study we estimated serum sodium (Na+), potassium (K+) and evaluated hydration from input output chart and clinical findings

So this study was designed to study the changes in serum sodium and potassium in ileostomy and colostomy patients in our institute.

II. METHODOLOGY

This hospital based prospective observational study was carried out in the Department of General Surgery, SMS Medical College, Jaipur (Rajasthan) India, in the year 2017.

Sample size calculated to be 99 subjects at alpha error 0.05 and study power 80% assuming the difference in mean sodium change to be 0.77mg and SD $\pm$ 2.7 mg and hence for study purpose100 subjects were taken

For this study, 100 subjects were selected randomly from the 18-65 years patients who admitted and undergone ileostomy/colostomy or ileostomy with or without ileal resection and postoperatively treated

with intravenous fluid and electrolyte at least up to 3rd postoperative day along with gradual resumption of oral intake or feeding jejunostomy/ ileostomy feeding and managed at least for 5 days. Cases who were with known co-morbities were excluded from study. Patients who refuses to participate in the study were also excluded from 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) in Biochemistry department of SMS Medical College, Jaipur.

On 1st, 3rd and 5th postoperative days, stoma output and serum sodium and potassium values were obtained in different types of ostomies and were statistically evaluated.

Statistical analysis: Qualitative data will be compared by Chi square test. Unpaired t test will be used to infer the difference in means. For significance, "p" value <0.05 was accepted as significant.

III. RESULTS

In this study mean age of the patients was 42.98 years with youngest patient was 19 yrs old and the oldest one being 75 yrs old.

The value of serum sodium ranges from 134-143.3 meq/l on post-operative day 1, 129.6-139.6 meq/l on post-operative day 3 and 130-138.8 meq/l on post-operative day 5. Six out of 100 patients on post-operative day 3 had serum sodium value of <135meq/l and 22 out of 100 had serum sodium levels < 135 meq/l on day 5. The rest of the patients had a value in the normal range of 135- 145 meq/l. (Table 1)

In group A the mean serum sodium in post-operative day 1, day 3, day 5 were 139.37 ± 1.71, 137.26 ± 1.55, and 135.69 ± 1.44 respectively. On comparing mean serum sodium on post-operative day 1 with day 3 and day 5 readings, a significantly lower reading was observed on day 3 ($p< 0.001$) and day 5 ($p< 0.001$). Also, the mean serum sodium when compared between day 3 and day 5 a significantly lower value was seen in day 5 ($p< 0.001$). (Table 1)

In group B, all ileostomy patients when day 1 mean serum sodium readings were compared with day 3 and day 5 a significant lower reading was observed in day 3 ($p< 0.001$) and .day 5 (0.001). When post-operative day 3 reading was compared with day 5 a significantly lower reading was seen in day 5 ($p< 0.001$). (Table 1)

In group C, ileostomy without resection of small intestine patients when day 1 mean serum sodium readings were compared with day 3 and day 5 a significant lower reading was observed in day 3 ($p< 0.001$) and day 5 ($p< 0.001$). When post-operative day 3 reading was compared with day 5 a significantly lower reading was seen in day 5 ($p< 0.001$). (Table 1)

In group D, colostomy patients when day 1 mean serum sodium readings were compared with day 3 and day 5 a significant lower reading was observed in day 3 ($p< 0.001$) and day 5 (0.005). when post-operative day 3 reading was compared with day 5 a significantly lower reading was seen in day 5 ($p< 0.001$). (Table 1)

In group E, ileostomy with resection of ileum patients when day 1 mean serum sodium readings were compared with day 3 and day 5 a significant lower value was observed in day 3 ($p< 0.001$) and day 5 (0.0005). When post-operative day 3 reading was compared with day 5 a significantly lower reading was seen in day 5 ($p< 0.001$). (Table 1)

In comparison of group (B), ileostomy and group (D) colostomy patients, no significant change ($p>0.05$) was observed when post-operative day 1 readings were compared. When post-operative day 3 and day 5 readings were compared between group (B) and (D), the readings in the ileostomy group were found to be significantly lower than that in the colostomy group ($p<0.05$).

In comparison of group (E) ileostomy with resection of small intestine and group (C) stoma with no resection of small intestine, no significant change ($p>0.05$) was obtained when post-operative day 1 readings were compared. When post-operative day 3 and day 5 readings were compared between these groups (C and E), the reading in group (E) ileostomy with resection of small intestine, were found to be non-significant in group (C) ($p>0.05$). (Table 1)

Table 1
Comparison of Serum Sodium (Meq/L) in various group of Stoma Patients

Type of Patients	Day 1		Day 3		Day 5		P value		
	Mean	SD	Mean	SD	Mean	SD	Day 1&3	Day 3&5	Day 1&5
All stoma patients (A)	139.37	1.71	137.26	1.55	135.69	1.44	0.0003	0.0002	0.0004
All ileostomy patients (B)	139.23	1.64	137.09	1.54	135.45	1.38	0.0004	0.0002	0.0003
Ileostomy patients with no resection (C)	139.10	1.72	136.91	1.68	135.41	1.5	0.0003	0.0001	0.0003
Colostomy (D)	139.99	1.91	138.03	1.47	136.73	1.26	0.001	0.006	0.0003
Ileostomy with resection of small bowel (E)	139.54	1.45	137.52	1.11	135.57	1.10	0.0003	0.0005	0.0003

The values of serum potassium ranged from 3.2-4.46 meq/l on postoperative day 1, 2.37-4.60 meq/l on postoperative day 3 and 2.84-4.55 meq/l on postoperative day 5. (Table 2)

In group having all stoma patients (group A), the mean serum potassium on post-operative day 1, day 3, day 5 were 4 ± 0.29 meq/l, 3.81 ± 0.30 meq/l, 3.68 ± 0.29 meq/l respectively. When mean serum potassium value on postoperative day 1 was compared to postoperative day 3 and day 5 readings, a significant lower value was observed, on postoperative day 3 ($p<0.001$) and day 5($p<0.001$). Also, when postoperative day 3 reading was compared with postoperative day 5 reading, significant lower value was observed on day 5 ($p<0.001$). (Table 2)

In group having all ileostomy patients (group B), when postoperative day 1 reading was compared with day 3 and day 5 reading, a significant lower value ($p<0.001$) was observed on postoperative day 5. When postoperative day 3 reading was compared with postoperative day 5 reading, significant change was observed ($p<0.01$). (Table 2)

Table 2
Comparison of Serum Potassium (Meq/L) in various group of Stoma Patients

Type of Patients	Day 1		Day 3		Day 5		P value		
	Mean	SD	Mean	SD	Mean	SD	Day 1&3	Day 3&5	Day 1&5
All stoma patients (A)	4.00	0.29	3.81	0.30	3.68	0.29	0.0003	0.001	0.0003
All ileostomy patients (B)	3.98	0.29	3.65	0.28	3.79	0.31	0.0002	0.003	0.0003
Ileostomy patients with no resection (C)	3.94	0.31	3.61	0.28	3.74	0.33	0.0002	0.023	0.0004
Colostomy (D)	4.09	0.29	3.94	0.29	3.82	0.32	0.117	0.236	0.010
Ileostomy with resection of small bowel (E)	4.07	0.22	3.89	0.21	3.73	0.27	0.004	0.032	0.0003

In group having ileostomy with no resection of small intestine (group C), when post-operative day 1 reading was compared to postoperative day 3 and day 5 readings, a significant lower value ($p<0.001$) was observed on postoperative day 3 and day 5. When postoperative day 3 was compared with postoperative day 5 reading, a significant lower reading ($p<0.05$) was observed. (Table 2)

In group having stoma with resection of small intestine (group E), when postoperative day 1 reading was compared to postoperative day 3 and day 5 readings, postoperative day 3 ($p<0.01$) and day 5 ($p<0.001$) readings were found to be significantly lower than day 1. A significant lower value ($p<0.05$) was observed in day 5 when postoperative day 3 were compared to postoperative day 5 reading. (Table 2)

In group having colostomy, no significant change ($p>0.05$) was observed when postoperative day 1 reading was compared to day 3 but when compared to day 5 reading a significant change was seen on day 5 ($p<0.05$). When day 3 values were compared with day 5 no significant change was observed ($p>0.05$). (Table 2)

In comparison of group (B) ileostomy and group (D) colostomy, no significant change in mean serum potassium values ($p>0.05$) was observed when postoperative day 1, day 3 and day 5 reading were compared between these groups. In comparison of group (C) ileostomy without resection of small intestine and group (E) stoma with resection of small intestine no significant change ($p>0.05$) was observed when postoperative day 1, and day 5 readings were compared between these groups but day 3 values were significantly lower in group C. (Table 2)

IV. DISCUSSION

Stoma surgeries are the lifesaving procedures in emergency conditions and decreases the mortality in devastating situations.

Present study revealed a significant decrease in serum sodium concentration postoperatively in patients who underwent stoma creation. Ileostomy patients had significantly lower mean serum sodium levels compared to colostomy patients on 3rd and 5th postoperative days ($p<0.05$).

On comparing mean serum sodium levels in ileostomy without small bowel resection and ileostomy with bowel resection on post-operative day 1, day 3, day 5 no statistically significant decrease in sodium levels were seen ($p>0.05$), though the decrease in serum sodium levels in post-operative period within both the groups were highly significant ($p< 0.001$).

In the group having all stoma patients, there was a decrease in the mean serum sodium level from postoperative day 1, day 3 and day 5 were statistically significant($p<0.05$). In the group having ileostomy with resection of small intestine, there was a decrease in mean serum sodium level from postoperative day 1 to day 5. The difference between post-operative day 1 and day 3 was significant and the difference between post-operative day 5 and post-operative day 3 ($p<0.001$) and day 1 was statistically highly significant ($p<0.001$).

In the group having stoma with no resection of small bowel, post-operative day 5 values of serum sodium were significantly lower than day 1 and day3 values ($p<0.001$).

These observations were similar to other authors like Hill GL et al,[2] Ganguly et al[3] Gallagher et al[4] and Clarke et al[5] who also observed sodium and water depletion in ilesostomized patients on early post-operative periods.

In the group having colostomy also, a significant lower serum sodium values were observed when post-operative day 5 readings were compared to day 1 and day 3 ($p<0.05$). This was on the contrary to other authors who have not observed any sodium depletion in colostomy patients, and this decrease could be possibly due to ongoing recovery during early post-operative period in our patients and environmental and patient factors which were different among other population group.

Kennedy HJ etall[6] conducted a study on 39 patients with a permanent ileostomy, who had had a proctocolectomy for ulcerative colitis. They reported that these ileostomists were found to lose excessive quantities of water and sodium in the ileostomy effluent compared with the corresponding losses in normal faeces. So they suggested that this is responsible for the body's partial compensation for the depletion of sodium and water, including the so-called ileostomy adaptation. [6]

Haalboom JR etall[7] found changes in dietary sodium led to only minor changes in the volume and composition of the ileal effluent. Significant associations were found between sodium intake and complaints. They also suggest that the well-being of many ileostomists can be improved by increasing the dietary sodium intake to a level higher than 250 mmol/day. [7]

In this study, the mean serum potassium levels in the postoperative period were in the normal range in all stoma patients.

In all groups of stoma patients, the value of mean serum potassium decreases slightly from post-operative day 1 to day 5 but remain within the normal range.

In the group A (all stoma patients), B (all ileostomy patients), C (ileostomy without resection of small intestine) and group E (ileostomy with resection of small intestine) when post-operative day 1 readings were compared with day 3 and day 5, a significant decrease in mean serum potassium values was observed ($p< 0.05$). These observations agreed with the findings of other researchers, Ganguly et al also observed a significant decrease in serum potassium levels in ileostomy patients in early post-operative period.[3] Comparable results were also documented by various other authors, Golighar JC etall,[2] Elkinton JR et al,[8] who observed a slight decrease in serum potassium levels in ileostomy patients, but no sign of potassium depletion in patients with ileostomy. [2,8] Also, some other authors had observed an increase in serum potassium level in patients with ileostomy N.D Gallagher et al, (1962), no such findings were observed in our study.[4]

In patients with colostomy, there was no significant decrease in serum potassium levels were observed on comparing day 1 readings with day 3 but a significant decrease in mean potassium level was present when day 1 was compared with day 5 ($p<0.05$). This finding was not in accordance with other authors, Ganguly et al who have not observed any change in serum potassium values in colostomy patients in early post-operative period. [3]

V. CONCLUSION

It can be concluded from this present study that patients with high output stoma are more prone to depletion of fluids and electrolytes than low output stoma, so they should be monitored and resuscitated

aggressively in early post-operative periods. So assessment of electrolyte is necessary in patients with these cases in early post-operative period.

CONFLICT OF INTEREST

None declared till now.

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