

# Study of electrolytic imbalance in acute intestinal obstruction in adults

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## Abstract

This observational study was carried out at our rural medical college in Bihar from the period September 2013 to June 2015. The aim was to evaluate changes in the level of different electrolytes in the body in cases of acute intestinal obstruction. As a matter of study 35 cases were taken as sample size. Major electrolytes were taken into consideration like Na<sup>+</sup>, K<sup>+</sup>, chloride, urea and bicarbonate. Regular blood investigations were done for 7 days to check their values and it was compared with the eggleston series. It was studied that there is persistent hyponatremia which had no relation to the duration of obstruction, potassium level remained almost constant, hypochloremia occurred, in early stages acidosis was noted and elevation in blood urea level was noted especially after 3<sup>rd</sup> day of obstruction.

**Keywords:** electrolytic imbalance.

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## INTRODUCTION

Electrolytes are salts in the body that conduct electricity and are found in the body fluid, tissue and blood. Examples are chloride, calcium, magnesium, sodium and potassium. Na<sup>+</sup> is concentrated in ECF and K<sup>+</sup> is concentrated in ICF. Proper balance is essential for muscle co-ordination, heart function, fluid absorption and excretion and nerve function. Bowel obstruction describes the failure of progression of intestinal contents. Based on nature, severity, location and etiology several terms are used to describe bowel obstruction e.g. functional, mechanical etc. Simple mechanical obstruction is the compromise of lumen of bowel without compromise of its vascular supply. In simple obstruction important and progressive changes take place in the bacteriologic

content of obstructed bowel, in the amount and composition of gas in the gut above obstruction, in circulation in the distended bowel and in the complex fluid and electrolyte fluxes that takes place across it. When strangulation complicates the picture, these pathological changes are compounded by the progressive vascular changes in the affected intestine and its mesentery and eventually leads to toxemia associated with actual death of gut wall. Eggleston *et al* noted that there is a persistent hyponatremia, a gradual drop in serum potassium beginning 5 days after onset of obstruction, a progressive decrease in chloride level over first week followed by a rise in urea level for a week and an initial tendency towards acidosis gradually replaced by alkalosis. The mainstay of treatment in intestinal obstruction includes gastro duodenal suction, intravenous fluid administration and operative correction. In order to identify the different electrolytic changes in adults with intestinal obstruction this study was conducted.

## MATERIAL AND METHODS

The material includes 35 cases of Acute intestinal obstruction in adult patients operated in MGM Medical College and LSK Hospital, Kishanganj, Bihar. The present study comprises cases admitted during the year 2013 and 2015. Only acute cases treated surgically and diagnosis of obstruction proved at the time of operation

are included in this series. Following were excluded in the study.

1. Patients with external hernia in which only omentum was found.
2. Patient with adynamic or post operative ileus.

Emphasis was placed upon determining the exact duration of obstruction and previous treatment including fluid therapy received prior to admission. The onset of abdominal pain was taken as criteria of onset of obstruction. Before starting the therapy, blood was taken for analysis. Initial values were taken into-consideration.

## RESULTS

Total number of admission in surgical ward in this period: Including all types of acute abdomen – 3445, Total number of Acute intestinal obstruction operated: During this period: 35 The data for total number of Acute intestinal obstruction admitted are not available. The percentage of surgical admission thus reads 1.01%. There was a male pre-ponderance due to inclusion of inguinal hernias. The oldest patient was 75 yrs old and the youngest patient was 15 yrs old. The mean age of this series was 40 yrs.

### Distribution of causes by etiology

Causes	No. of cases	Percentage (%)
Adhesions		
Postoperative - 15	18	51.4
Inflammatory - 1		
Congenital band - 2		
External Hernia	9	25.7
Strictures	3	8.5
Malignancy	1	2.8
Intussusception	3	8.5
Internal Hernia	1	2.8
<b>Total</b>	<b>35</b>	

Adhesive obstruction forms the largest group in this series (51.4%) i.e.15 cases of postoperative adhesions (83%), 2 congenital band (11.1%) and 1 inflammatory adhesions (5.5%) are included in this group. External hernia formed the second largest group (25.7%) 3 of these cases presented with strangulation (33.33%). All the strictures were tuberculous. The only patient who presented with malignancy of rectosigmoid region underwent defunctioning transverse colostomy and a second stage resection anastomoses. Internal hernia occurred through an incompletely closed transverse mesocolon during a Gastrojejunostomy. Intussusceptions were jejunojunal with perforation, ileoileal with perforation and ileocolic intussusception and gangrene. Patients who had developed perforation had 100% mortality inspite of their early presentation. The cause of death in these patients were multifactorial including

electrolyte imbalance and septicemia. The two patients who developed perforation had intussusception.

### Mortality Rates

Total No.: of cases: 35, Mortality: 3, Percentage: 8.5%

### Electrolyte Imbalances

Table 1: Serum Sodium Changes

Duration	Present Series	Eggleston Series 1972
1 days	129.7	131.6
2 days	129.7	135.7
3 days	133.3	132.7
4 days	128.5	130.6
5 days	124.0	134.9
6 days	121.0	130.5
7 days or more	129.0	138.7

Individual serum sodium levels in this series ranged from 121 mEq/L to 133.3 mEq/L. In Eggleston series the values ranged from 130.5 to 138.7 mEq/L. The named serum sodium levels are 132-144 mEq/L.

Table 2: Serum Potassium Levels

Duration	Present Series	Eggleston Series 1972
1 days	4.15	4.39
2 days	4.3	4.28
3 days	5.1	4.45
4 days	3.9	4.32
5 days	4.26	4.29
6 days	4.5	4.18
7 days or more	4.7	4.03

Table 3: Serum Chloride Levels

Duration	Present Series	Eggleston Series
1 days	88.9	98.2
2 days	96.8	98
3 days	92.6	95.5
4 days	92.1	90.5
5 days	92.2	91.2
6 days	87	90.2
7 days or more	90	97.0

Serum chloride ranged from 87 mEq/L to 97.1 mEq/L. In Eggleston series values ranged from 90.5 to 98.2 mEq/L.

Table 4: Bicarbonate Levels

Duration	Present Series	Eggleston Series
1 days	20.5	22.6
2 days	20.6	25.6
3 days	20.6	25.3
4 days	19.7	25.5
5 days	21.6	26.7
6 days	18.5	24.1
7 days or more	22	27.2

Normal bicarbonate levels varied from 21-27.5 mEq/L. Bicarbonate values in this series ranged from 18.5 to 22 mEq/L.

**Table 5: Blood Urea Levels**

Duration	Present Series	Eggleston Series
1 days	52	73.8
2 days	35.2	60.9
3 days	42.6	93.9
4 days	51.7	103.5
5 days	58.3	100.1
6 days	68.0	120.1
7 days or more	43.6	69.4

Normal urea levels vary from 15-40 mg/100 ml. In this series the mean values ranged from 35.2 – 67.5 mg%. In Egglestone series mean values ranged from 60.9 to 120 mg/100 ml. To summarize these studies showed the following features:

1. Persistent hyponatremia but with no relation to duration of obstruction.
2. Serum potassium levels remained remarkably constant.
3. Chloride levels were also low.
4. Acidosis was noted in the early stages of obstruction.
5. Elevation of blood urea levels especially after 3 day of obstruction.

Comparing with Egglestone Series:

1. Persistent hyponatremia.
2. A gradual drop in serum potassium level beginning 5 days after onset of obstruction.
3. A progressive decrease in serum chloride level over the 1<sup>st</sup> week followed by a rise.

An initial tendency towards acidosis gradually replaced by alkalosis

## DISCUSSION

Most of patients has presented between 2<sup>nd</sup> and 5<sup>th</sup> day. The longest duration of presentation was 10 days. There were 3 deaths in the group (8.5%). With delayed presentation the mortality and morbidity is expected to be high. This is not so in the case, since patients who presented late in our hospital had already received treatment from outside and hence were relatively in stable conditions. The prognosis of intestinal obstruction was considerably improved when the extent of associated water and electrolyte loss and need for intravenous replacement were recognized [Aird 1941; Hartwell and Hognet 1912]. It is also realized that the composition and quantity of infused fluid must be carefully controlled. The increased intestinal loss, an obviously undesirable side effect is not always appreciated. The objective of this study is thus to highlight the importance of knowing the fluid and electrolyte disturbances in patients with intestinal obstruction and correction of these deficits by intravenous infusion so that deficits are not only corrected but the replaced fluid is distributed correctly between body compartments, thus improving the prognosis of that

patient. Individual serum sodium levels in this series ranged from 121 mEq/L to 133.3 mEq/L. (Normal 132-144 mEq/L). In Eggleston series (1972) the values ranged from 130.5 to 138.7 mEq/L. Thus a persistent hyponatremia with no relation to duration of obstruction was noted in both series. A gradual drop in serum potassium level beginning 5 days after obstruction was noted in Egglestone series. No such changes were noticed in this series. Mean values ranged from 3.9-5.1 (normal 3.5 - 5.3 mEq/L). Normal serum chloride ranges from 95-107 mEq/L. In this series sodium chloride ranged from 90.5 to 98.2 mEq/L, hypochloremia was thus persistent. Eggleston noted a rise of serum chloride levels after 1 week. Elevation of blood urea levels especially after 3 day of obstruction was noted in this series reflecting progressive dehydration. Early obstruction tended to be associated with acidosis, where as late obstruction leads to alkalosis (Egglestone *et al*). In present series acidosis was noted (normal bicarbonate values 21-27.5). The first phase-acidosis would be due to de-hydration. While this dehydration continues to increase, its effect on acid base status is superceded by constant loss of acid and chloride through vomiting. This lead to alkalosis. The biochemical changes thus noted are persistent hyponatremia, remarkably constant serum potassium, low chloride levels, acidosis and elevated brood Urea level.

## CONCLUSIONS

1. A review of 35 cases of intestinal obstruction in adults operated during September 2013 and June 2015 presented with emphasis on electrolyte imbalance. Emphasis was placed on determining the exact duration of obstruction and previous treatment including fluid therapy received prior to admission.
2. Intestinal obstruction formed 1.01% of surgical admission.
3. Treatment received prior to admission was of significance with relation to the prognosis and decrease in mortality rates.
4. The improved mortality and morbidity rates could be attributed to early diagnosis and treatment inspite of presenting late to hospital.
5. A persistent hyponatremia, remarkably constant serum potassium hypochloremia, a rise in urea levels and acidosis were noted. Comparisons have been made with the available series.
6. Shock, dehydration, electrolyte changes and septicemia are important causes of death.

Better prognosis is attributed to better anaesthetic techniques, better knowledge of fluid and electrolyte replacement, efficient blood transfusion services and introduction of antibiotics and gastrodueodenal suction.

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