

## STUDY OF SERUM ELECTROLYTES, VITAMIN B12 LEVELS IN PATIENTS WITH TEMPORARY-DEFUNCTIONING ILEOSTOMY- A CASE SERIES

Anil Kumar<sup>1</sup>, Girish Kumar<sup>2</sup>, Chinmay Nalla<sup>3</sup>

<sup>1</sup>Professor, Department of General Surgery, JSSAHER, Mysuru India.

<sup>2</sup>Assistant Professor, Department of General Surgery, JSSAHER, Mysuru, India.

<sup>3</sup>Postgraduate, Department of General Surgery, JSSAHER, Mysuru, India.

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Corresponding Author:

**Dr. Nalla Chinmaysai**

Email: chinmaysai5@gmail.com

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### Abstract

**Background:** Patients presenting to the emergency setting with pain abdomen are a common occurrence. Damage control is often managed with ileostomy, with closure usually planned within three months. This alteration of the normal homeostasis of nutrient absorption in the gut can have an effect on the absorption of Vitamin B12, a micronutrient absorbed in the ileum, and also affects electrolyte abnormalities. This study seeks to determine any correlation between serum Vitamin B12 levels, associated anemia and electrolytes in patients with temporary-defunctioning ileostomy over a period of time.

## INTRODUCTION

Vitamin B12 is an essential nutrient that plays a role in many bodily functions, including the production of red blood cells, neurological function, and energy metabolism. The excision of a segment of the ileum, a component of the small intestine, and the formation of an aperture in the abdominal wall is known as a defunctioning ileostomy. This operation can have a detrimental effect on the assimilation of essential nutrients, including vitamin B12. This study aims to explore the effects of this procedure on electrolytes and vitamin B12 levels in patients with temporary-defunctioning ileostomies and to identify any potential interventions to manage any potential deficiencies. Electrolyte abnormalities in patients with temporary defunctioning ileostomy can include hypokalemia, hyponatremia. Hypokalemia is a condition characterized by decreased levels of potassium in the blood whereas hyponatremia is a condition characterized by decreased levels of sodium in the blood. These electrolyte abnormalities can lead to a variety of symptoms, such as fatigue, muscle weakness, cramps, and nausea. In more serious cases, electrolyte abnormalities can lead to muscle paralysis, cardiac arrhythmias, seizures, and even death. The treatment of electrolyte abnormalities in patients with temporary defunctioning ileostomy typically involves the use of oral or intravenous electrolyte solutions. In addition, dietary modifications may be recommended to help maintain a healthy electrolyte balance. The goal of treatment is to restore and maintain the electrolyte balance in these patients. It

is important to note that electrolyte abnormalities can be recurrent in these patients and may require ongoing monitoring and treatment.

Vitamin B12 is indispensable for the formation of red blood cells, the optimal performance of the nervous system, and the synthesis of DNA. A deficiency of this vitamin in the body can lead to anaemia, nerve damage, and other long-term health issues. The construction of an ileostomy is frequently a requirement in abdominal procedures, necessitating the creation of either a permanent or temporary stoma. Ileostomies are external openings created on the body wall by bringing out the bowel where the faecal wastes are collected outside commonly in a bag. The patient's bowel distal to the stoma is allowed to heal over the period and planned for reversal over the period of 10-12 weeks.

The ileum is the segment of the small intestine that comes after the duodenum and jejunum, and is divided from the cecum by the ileocecal valve (ICV). Its primary purpose is to absorb vitamin B12, bile salts, and any other substances that were not absorbed by the jejunum. The ileum has a vast surface area which allows for the attachment of enzyme molecules and the uptake of the products of digestion. Ileostomies are generally of two types; temporary and permanent. Permanent ileostomies are carried out in patients with malignant growth of the distal colon or any condition of the colon such as Crohn's leading to toxic megacolon. A temporary ileostomy is a surgical procedure in which the distal bowel is disconnected from the rest of the intestine and a stoma is created to allow for the resolution of acute pathology. Once the healing process is

complete, the temporary ileostomy can be reversed through a surgical procedure that reconnects the loop of the intestine and closes the incision in the skin. This research seeks to explore the effects of a temporary-defunctioning ileostomy on vitamin B12 levels in patients, as there is a lack of understanding regarding the intricate process of B12 absorption and how issues at any stage of this process can lead to deficiency, even when dietary intake is sufficient. Even though patients with intact ileums and functioning ileostomies may be able to adjust to the daily losses of 200 to 1,000 mL of fluid containing 40 to 100 mmol of sodium, 15 to 30 mmol of bicarbonate, and 5 mmol of potassium, the removal of the colon and construction of an ileostomy can still present challenges for acid-base and electrolyte equilibrium. The findings of this study will provide valuable information to healthcare providers on the potential risks of vitamin B12 deficiency and electrolyte abnormalities in temporary-defunctioning ileostomy patients.

## MATERIALS AND METHODS

### Study Design

Observational study

a. Study Duration

One and half year

b. Sampling technique

Purposive sampling

Study setting and Method of collection of data:

Vitamin B12 were measured in patients undergoing ileostomy and the investigation will be repeated after 3 months when patient is admitted for ileostomy closure. Values will be compared and absorption of vitamin B12 in patients during the during the period between ileostomy and closure is assessed. Serum electrolytes were measured on POD3 and were compared to pre-op values

Study Population and source of data: subjects eligible satisfying the inclusion and exclusion criteria undergoing ileostomy in JSS hospital, Mysuru .

Subject Eligibility

### Inclusion Criteria

- All patients male and female with age between 14 - 70 years
- All emergency and elective cases undergoing ileostomy

### Exclusion Criteria

- All the children below 14 years
- Refusal by the patient to participate in the study
- All patients with Chronic Kidney disease
- End stage liver disease

Study Assessments of end points– Vitamin B12 levels are assessed in patients undergoing ileostomy during the time of admission using Chemiluminescence immunoassay method in Jss hospital, Mysuru. Electrolyte abnormalities were also assessed using standard biochemical tests. The values are repeated after 3months in the patients when the patients are admitted for ileostomy closure using the same method of chemiluminescence immunoassay.

## RESULTS

Patients undergoing ileostomy vitamin B12 levels are assessed by Chemiluminescence immunoassay and values of B12 during ileostomy and during ileostomy closure are compared and evaluated to assess the absorption of vitamin B12 in patients with ileostomy.

- 14 patients were studied over the period of one and half year who underwent ileostomy at jsshospital mysuru. Vitamin b12 was sent in the admission when the patient underwent ileostomy and patients got discharged subsequently and a repeat sample was sent the patients got admitted for ileostomy closure.

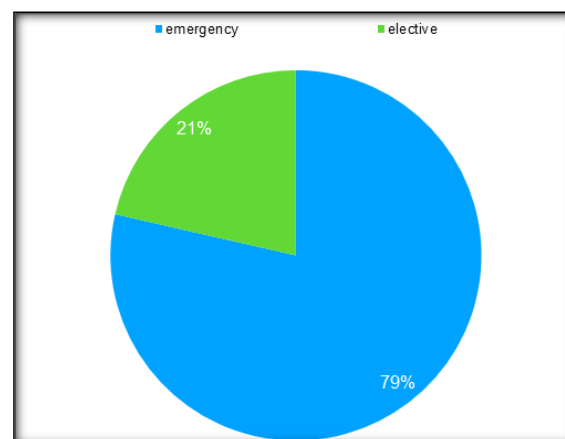


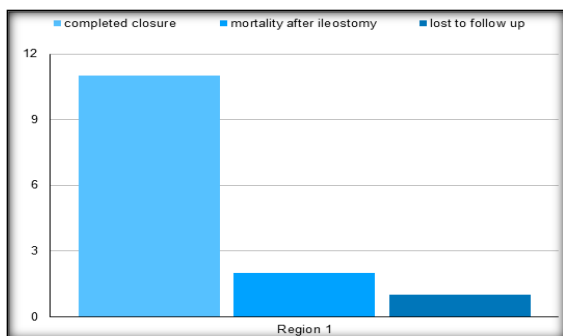
Figure 1:

Table 1:

|                        | Emergency        | Elective |
|------------------------|------------------|----------|
| total sample size (14) | 11 (approx 80 %) | 3 (20%)  |

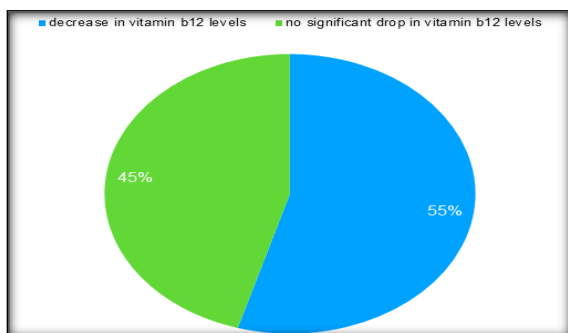
- In approx 80% of the cases the ileostomy was done on emergency basis where usually the indication was perforation secondary to obstruction or mesenteric ischemia. In 20% of the cases the etiology of more complex origin where surgery was done for malignant growth such as non hodgkins lymphoma. Out of 14

patients, 11 were followed up over the period of 3 months and closure was completed subsequently. 1 patient succumbed to the post-operative complications and 2 patients among 14 was lost to followup.

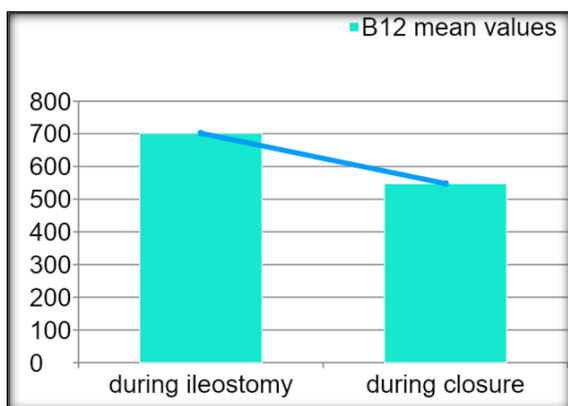


**Figure 2:**

- 6 out of 14 patients, there was significant decrease in vitamin b12 levels before and after ileostomy. 5 patients had more or less similar values after 3 months.
- Incidence of anemia was noted in around 3 subjects of the study group where it was due to iron deficiency anemia. In 2 patients there was significant drop in hb over the period but reason for the couldn't be accredited to vitamin b12 levels.



**Figure 3:**



**Figure 4:**

Serum electrolyte levels were assessed preoperatively and on postoperative day 3, revealing a decrease in sodium and potassium values. This was markedly elevated in patients with high output fistulas. Additionally, urinary pH was measured, and an increase in pH values in 8 patients demonstrated a state of dehydration and bicarbonate loss via urine.

## DISCUSSION

A surgical technique involving the diversion of a section of the ileum from the small intestine to an opening in the abdominal wall, forming a stoma, is referred to as a temporary defunctioning ileostomy. The purpose of the procedure is to divert the flow of intestinal contents away from the rest of the gastrointestinal tract, allowing the affected area to heal. Construction of temporary loop ileostomy to also provides defunctioning for the repair of ileal perforations and reduces the incidences of fatal complications.<sup>[1]</sup>

Vitamin B12 is present in food as co-enzymatically active forms bound to protein from which they must be freed by processing or digestion prior to absorption. Intrinsic factor, which is released by parietal cells in the stomach, binds to vitamin B12 in the duodenum.<sup>[2]</sup> This vitamin B12–intrinsic factor complex subsequently aids in the absorption of vitamin B12 in the terminal ileum. Thus abnormal ileal structure may reduce B12 absorption and function leading vitamin B12 absorption. The Possibility of changed microbial balance/abnormal ileal structure in the terminal ileum after ileostomy may alter the vitamin B12 and electrolyte absorption. The study focuses on presence of any correlation between serum vitamin B12 levels and absorption of electrolytes in patients of Temporary-defunctioning ileostomy over the period of time.

In eighty percent of the cases, the ileostomy was done on an emergency basis, usually due to perforation or mesenteric ischemia. The remaining twenty percent of cases had a more complex etiology, such as non-Hodgkin's lymphoma. Of the fourteen patients, eleven were followed up for three months and had successful closure. One patient died due to postoperative complications, and two were lost to follow-up. In 20% of the cases the aetiology of more complex origin where surgery was done for malignant growth such as non-Hodgkins lymphoma etc. 6 out of 14 patients, there was a significant decrease in vitamin b12 levels between ileostomy and closure. 5 patients had more or less similar values after 3 months. Corollaries that were done previously showed similar findings.

In a study done by A Jayaprakash et al in 2004 concluded that there was no significant correlation between serum vitamin B12 levels and duration of ileostomy overall or in the disease subgroups.<sup>[3]</sup>

In a study done by Jagenberd et al.<sup>[4]</sup> in 1975 performed a study about vitamin B12 absorption in patients with continent ileostomy and concluded that the construction of a continent ileostomy reservoir thus does not appear to expose the patient to an increased risk of developing vitamin B12 malabsorption.

In 1969 with title Vitamin B12 Absorption in Ileostomy Patients after Operation for Ulcerative Colitis published by Hultén, L et al.<sup>[5]</sup> concluded that the possibility of a changed microbe balance in

the terminal ileum after ileostomy, as the cause of the apparently temporarily lowered vitamin B12-absorption. This generalised opinion of reduced vitamin b12 levels can be attributed to several factors. Firstly, there is a loss of functional mucous membrane area and there is an actual loss of ileal length due to the operative procedure of creation of the pouch. This incidence is more in patients with ileostomy was done more proximally as majority of absorption occurs in distal ileum. The optimal method of supplementation of vitamin B12 in patients who have had ileal resections is unclear. Traditionally, the approach has been to supplement them parenterally with monthly vitamin B12 injections. Recent studies have shown that small amounts of vitamin B12 are absorbed passively in normal individuals; therefore, if patients with pernicious anemia are supplemented with large oral doses, they will absorb enough vitamin B12 to prevent deficiency.

In a study done by Weise et al, Patients may experience either metabolic acidosis or metabolic alkalosis, along with possible variations in serum potassium levels, based on the degree and duration of fluid loss.<sup>[6]</sup>

## CONCLUSION

The study focussed on presence of any correlation between serum vitamin B12 levels, electrolytes and its absorption in patients of Temporary-defunctioning ileostomy over the period of time and from the present investigation, it can be concluded that the construction of the ileostomy per se does seem to expose the patients to an increased risk of developing vitamin B12 malabsorption. Detection of serum B12 deficiency and replacement of vitamin B12 parenterally is readily available, effective and cheap and high prevalence of B12 deficiency amongst these patients would suggest that we should routinely screen all such patients and give correction

accordingly. and also above cases show us how essential it is to be aware of the threat of sudden, potentially lethal acid-base and electrolyte imbalances, as well as volume depletion in patients with an ileostomy. Patients should be made aware of the importance of obtaining medical advice in a timely manner if they experience an increase in ileostomy drainage or reduced oral intake due to an illness as fluid loss and diminished kidney function can take place quickly.

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