Section: General Surgery

Original Research Article

A STUDY ON RAISED SERUM LDH LEVEL IN ACUTE INTESTINAL OBSTRUCTION- A MARKER OF BOWEL GANGRENE

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ABSTRACT

Background: To investigate the elevated LDH level in patients with acute intestinal obstruction and bowel viability in PESIMSR, December 2020–June 22.

Materials and Methods: In the present study, estimation of serum LDH was conducted in 45 cases of acute intestinal obstruction who were admitted to surgical wards of PES hospital from December 2020 to August 2022. LDH was estimated in all the cases preoperatively on the day of admission.

Results: The total number of patients who presented with obstruction is 45 out of which 25 were found to have elevated LDH which is about 55.56%. Out of 25 patients who presented with elevated LDH and 20 patients were found to have gangrenous bowel. Most commonly pain is associated with vomiting is 84% followed by abdominal distension at 40%, obstipation at 36%, pyrexia at 24%, blood in stools at 8%, and diarrhea at 4%. All the patients were given broad-spectrum antibiotics and injection metronidazole for 7 days. 5 patients developed wound infections and were treated according to the wound culture and sensitivity.

Conclusion: From this study, it is evident that ischemic changes in any part of the bowel can cause an elevation in the serum levels of LDH and a higher value of >1000 IU/L strongly indicates an underlying gangrenous change. It is a less invasive, cost-effective, and easily available diagnostic tool to diagnose bowel ischemia/gangrene. Hence it is more useful in centers where the diagnostic facilities are limited. The pre-operative estimation of serum LDH levels in patients presenting with features of acute intestinal obstruction helps in identifying the patients who undergo intestinal ischemia and gangrene at the earliest which makes early intervention possible and helps in reducing the morbidity and mortality due to bowel gangrene.

Keywords: LDH, Bowel Obstruction, Gangrene, Abdominal distension, Metronidazole.

INTRODUCTION

Around the world, 20% of all surgical emergencies are due to intestinal obstruction. Numerous factors can lead to intestinal obstruction.[1] This increased mortality was linked to the difficulty in making an early diagnosis, the patient's delayed admission to the hospital, and the unavailability of a precise diagnostic tool for evaluating bowel gangrene.

Bowel gangrene may occur through strangulation which superimposes and compromises the bowel's blood supply.[2] In India and post-operative adhesions in industrialized nations, strangulated hernias are the most common causes of bowel gangrene associated with mechanical blockage.[1,2]

A major abdominal catastrophe with a high mortality rate is bowel gangrene. The difficulty to diagnose intestinal gangrene early, the patient's late admission to the hospital, and the lack of precise diagnostic tools for detecting it are all responsible for the increased mortality.[4]

The enzyme lactate dehydrogenase (LDH), which is extensively distributed in cells of different living systems, is essential for the interconversion of lactate and pyruvate in carbohydrate metabolism.[1] An enzyme known as lactate dehydrogenase is widely distributed in the intestinal mucosa, and when the intestinal mucosa undergoes tissue hypoxia/ischemia, it is released into the blood, raising its serum level. Therefore, periodic estimation of serum LDH enables us to assess whether or not obstruction progresses to gangrene.[1,2]

The purpose of this study was to emphasize the importance of early detection of an increase in LDH levels followed by an early intervention, which reduces the morbidity and mortality caused by bowel gangrene following obstruction.

LDH BASICS

Other conditions where LDH is frequently encountered both clinically and on a standardized test:

- Diagnose ischemic hepatitis (LDH / ALT >1)
- Diagnose renal infarction (LDH 4 times the upper limit of Normal)
- Diagnose germ cell tumors
- To predict mortality in Patients with acute pancreatitis.

Aim of the study

To investigate the elevated LDH level in patients with acute intestinal obstruction and bowel viability in PESIMSR, December 2020–June 22.

Objective of the Study

1. To determine serum LDH levels in individuals experiencing signs of intestinal obstruction
2. Identifying those who have elevated serum LDH levels and correlating those raised LDH levels to bowel viability

MATERIALS AND METHODS

Here In this study, estimation of serum LDH was conducted in 45 cases of acute intestinal obstruction who were admitted to surgical wards of PES hospital from December 2020 to August 2022. LDH was estimated in all the cases preoperatively on the day of admission.

Inclusion Criteria

1. Patients presenting with features of acute intestinal obstruction.
2. Patients with irreducible inguinal/femoral hernia.
3. Patients with features of intestinal obstruction were diagnosed preoperatively as a case of SMA/SMV occlusion.

Exclusion Criteria

1. Patients < 18 years and >80 years.
2. Pregnant women
3. Psychiatric patients.

All the patients eligible by inclusion and exclusion criteria were included in the study. All the cases were thoroughly examined. The time of presentation and onset of symptoms was noted. Serum LDH was estimated in all the patients at the time of admission and the estimated value of serum LDH is compared with the viability of the bowel intraoperatively.

Source of the data

In this study, the estimation of serum LDH was conducted in 45 cases of acute intestinal obstruction who were admitted to surgical wards of PESIMSR from December 2020 to August 2022.

LDH was estimated in all the cases preoperatively on the day of admission.

Statistical Analysis

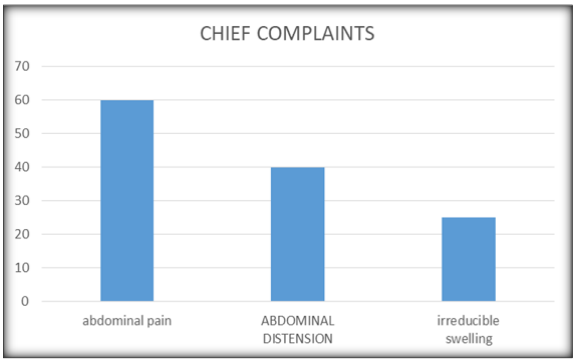
The Data will be entered into MS EXCEL 2007 version and further analyzed using STATA14.

RESULTS

The total number of patients who presented with obstruction is 45 out of which 25 were found to have elevated LDH which is about 55.56%. Out of 25 patients who presented with elevated LDH and 20 patients were found to have gangrenous bowel.

AGE INCIDENCE

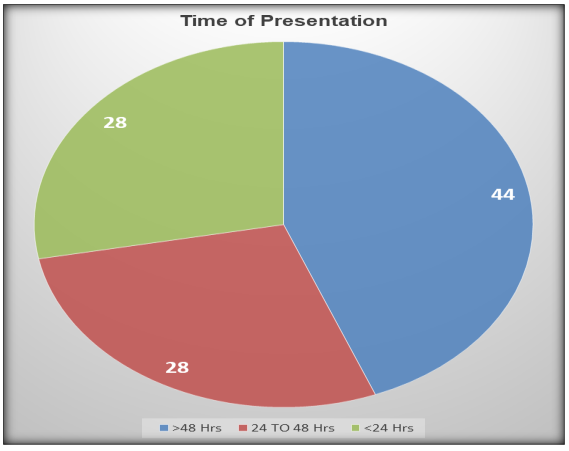
The age incidence in this study was between 19yrs to 80yrs.



Graph 1: Chief complaints in the study patients

DURATION OF SYMPTOMS

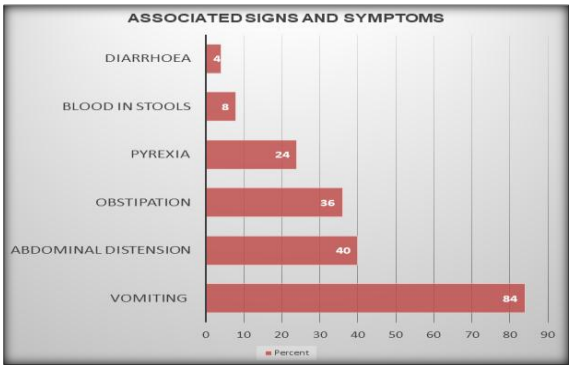
44% of patients presented to the hospital within>48 hours of the onset of symptoms, 28% in 24 to 48 hours, and 28% in <24 hours.



Graph 2: Duration of symptoms in study patients

ASSOCIATED SYMPTOMS AND SIGNS

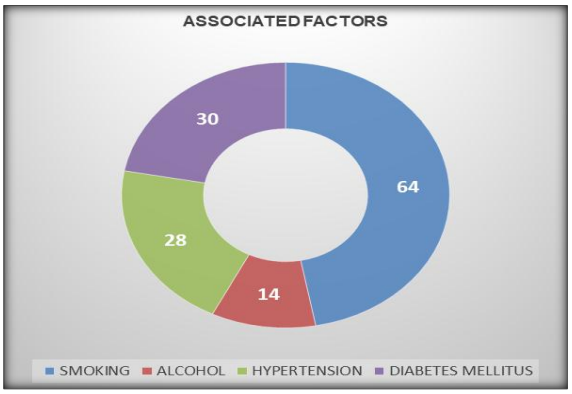
Most commonly pain is associated with vomiting is 84% followed by abdominal distension at 40%, obstipation at 36%, pyrexia at 24%, blood in stools at 8%, and diarrhea at 4%.



Graph 3: Associated signs and symptoms in study patients

ASSOCIATED FACTORS

Most commonly associated factor out of 25 cases with gangrene is smoking 64%, alcohol 14%, hypertension 28%, and diabetes mellitus 30%.



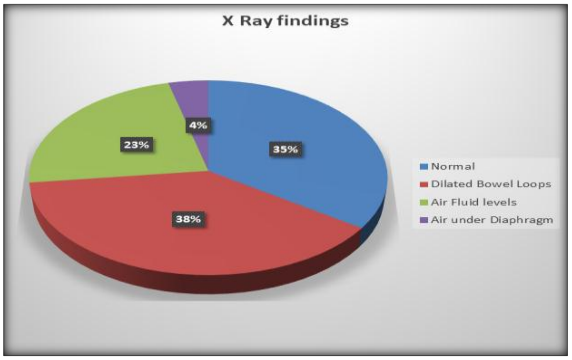
Graph 4: Associated factors in study patients

PER RECTAL EXAMINATION

76% normal fecal staining, 12% blood-stained feces, and 8% empty.

X-RAY ABDOMEN

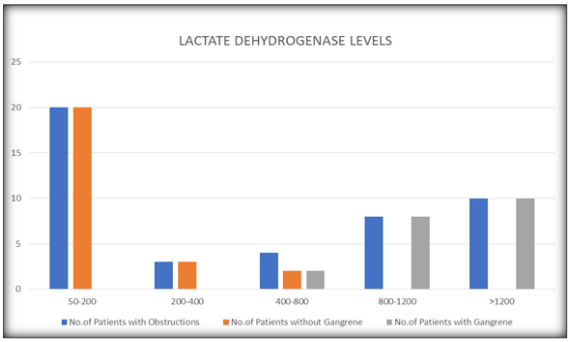
Done in all patients. 36% no significant finding, 40% dilated bowel loops, 24% air-fluid levels, and 4% air under the diaphragm.



Graph 5: X-ray findings in study patients

LACTATE DEHYDROGENASE LEVELS IN VARIOUS PATIENTS

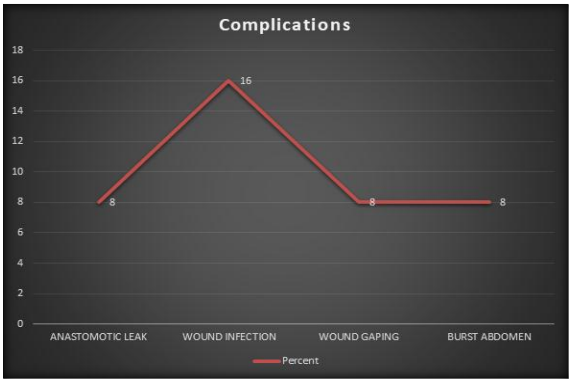
The normal range of serum LDH is 50 to 200 IU/L.Among 45 patients who presented with obstruction, 20 patients had LDH levels between 50 to 200 and all 20 patients had normal bowel viability and 3 patients had LDH levels between 200 to 400 and all three patients had normal bowel viability. 4 Patients had LDH levels between 400 to 800 and two of them had normal bowel viability and two others had bowel gangrene. 8 Patients had LDH levels between 800 to 1200 and all of them had bowel gangrene. 10 Patients had LDH levels of more than 1200 and all of them had bowel gangrene



Graph 6: LDH levels in study patients

COMPLICATIONS

Anastomotic leak 8%, wound infection 16%, wound gaping 8%, burst abdomen 8%.



Graph 7: Post-operative complications in study patients

POST-OPERATIVE FOLLOW-UP

All the patients were given broad-spectrum antibiotics and injection metronidazole for 7 days. 5 patients developed wound infections and were treated according to the wound culture and sensitivity. Daily examination of laparotomy wound and drain site done. All patients were catheterized until adequate output was maintained and continuous RT aspiration was done until <20 ml aspirated for 24 hours. One patient required mechanical ventilatory support and was extubated on the first POD. Patients with systemic hypertension and diabetes mellitus are managed accordingly.

Table 1: Relation between age, patients presented with intestinal

AGE	No. OF PATIENTS WITH OBSTRUCTION	No. OF PATIENTS WITH ELEVATED LDH	No. OF PATIENTS WITH GANGRENOUS BOWEL
20-Oct	1	1	1
20-30	5	3	1
30-40	7	4	2
40-50	15	8	7
50-60	9	5	4
60-70	6	3	3
70-80	2	1	2
TOTAL	45	25	20

CHIEF COMPLAINTS

Most commonly presented with abdominal pain at 60 % and irreducible swelling at 40%.

Table 2: Relation between no of cases, raised serum LDH and gangrenous bowel

ETIOLOGY	No. OF CASES	No. OF CASES WITH INCREASED LDH	No. OF CASES WITH GANGRENOUS BOWEL
Adhesive intestinal obstruction	23	9	7
Strangulated inguinal hernia	8	6	4
SMA occlusion	6	4	4
Post-operative constriction bands	5	3	2
Strangulated femoral hernia	2	2	2
SMV occlusion	1	1	1
TOTAL	45	25	20

DISCUSSION

One of the most frequent surgical emergencies in daily practice is the acute abdomen.[1] It is frequently very challenging to understand and analyze the pathology and reach final conclusions because the abdomen is thought of as the "Pandora's box" due to the wide range of conditions and pathologies it can have, especially when an acute abdomen is present because of acute mesentery ischemia, which is typically a diagnosis of exclusion.[2]

When it is related to intestinal pathology, It's often required to take the help of radiological interventions such as X-rays, Ultrasonography, or The present study was undertaken to emphasize the importance of early estimation of LDH in acute intestinal obstruction. Gangrenous bowel is recognized as a potential cause of mortality. It occurs due to various causes.

This study was undertaken with the notion to identify the patients with features of acute intestinal obstruction who are at risk of developing bowel gangrene at the earliest by estimating the serum LDH preoperatively.[7,8]

The level of lactate dehydrogenase elevates during an inflammatory process due to cellular function alterations and damage to the cells. The cell membrane permeability becomes altered due to ischemia and hypoxia and LDH is released into the circulation. The normal level of serum LDH is 50 to 200 IU/L.

Out of 45 patients, 25 patients had elevated serum LDH 71 which is about 55.56% and among those 25 patients, 20 patients were found to have bowel gangrene which is about 80%.

In our study, the mean value of elevated serum LDH in bowel gangrene patients is 1037 IU/L. The youngest patient is 19 years old and presented with a post-operative constriction band causing gangrene of the ileum. The oldest patient is 80 years old and presented with strangulated inguinal hernia.

The peak incidence is in the fifth decade at 33.3% and the most common cause of obstruction is found to be adhesive intestinal bands which are about 49% among those 22 patients 8 patients had elevated LDH which is about 36.4%. Among 12 of those 8 patients, 6 patients were found to have gangrene intraoperatively which is about 75%.

8 patients presented with a strangulated hernia which is about 17.8% and among those 8 patients, 6 patients had elevated serum LDH which is about 75%. 12 And among those 6 patients, 4 patients were found to have gangrenous bowel which is 66.7%. 6 patients were found to have SMA occlusion and 4 patients among them were found to have elevated serum LDH.

All 4 SMA occlusion patients with elevated serum LDH were found to have gangrenous bowel, which is 100%. 4 patients were found to have post-operative constriction bands among whom 2 patients had elevated serum LDH which is 50%. Among those 2 patients with elevated serum LDH, one patient had bowel gangrene which is 50%. 2 patients presented with a strangulated femoral hernia and both of them had elevated LDH and gangrene. The incidence of bowel obstruction and gangrene is more common in males (72%) than females (28%).

A strangulated hernia occurs more commonly in males than females due to increased physical activities and strenuous efforts. Mesenteric vessel occlusion is also more common in males than females may be due to thrombogenic factors like smoking and alcoholism.[10]

The delayed time of presentation was shown to influence morbidity and mortality. Increased morbidity is seen in gangrene patients due to undue delay in presentation due to prolonged exposure to bacterial toxins leading to the onset of septicemia.

Previously, an elevated level of serum LDH is considered as an indicator to assess the time of onset of myocardial infarction.

Recently, an elevated level of serum LDH is visualized in patients who had bowel gangrene.

According to Muchas9, an elevated level of LDH is found in 86% of patients who had bowel gangrene. "Lactate dehydrogenase is one of the markers of intestinal ischemia" Thompson.

A study conducted by Lange,[11] H, Jackel. R revealed an inference of 100% sensitivity and 42% specificity for increased LDH in patients presenting with acute abdomen who later are found to 12 have intestinal ischemia and gangrene.

Dr. Neil R Feins suggested that the level of LDH can be taken as a criterion for intestinal obstruction.

CONCLUSION

From this study, it is evident that ischemic changes in any part of the bowel can cause an elevation in the serum levels of LDH and a higher value of >1000 IU/L strongly indicates an underlying gangrenous change. It is a less invasive, cost-effective, and easily available diagnostic tool to diagnose bowel ischemia/gangrene. Hence it is more useful in centers where the diagnostic facilities are limited. The pre-operative estimation of serum LDH levels in patients presenting with features of acute intestinal obstruction helps in identifying the patients who undergo intestinal ischemia and gangrene at the earliest which makes early intervention possible and helps in reducing the morbidity and mortality due to bowel gangrene. Early diagnosis and early intervention is the key to reduce the mortality rate due to bowel gangrene. This study was conducted in PES medical college hospital and the results are similar and comparable to the other studies.

Conflict of Interest: None
Funding Support: Nil.

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