Role of Serum Lactate as a Prognostic Marker in Intestinal Obstruction

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Introduction: Intestinal obstruction is a common surgical emergency associated with significant morbidity and mortality, particularly when complicated by bowel ischemia and strangulation. Early identification of patients at risk for poor outcomes remains a clinical challenge. Serum lactate, a biomarker of tissue hypoxia and anaerobic metabolism, has been proposed as a useful prognostic indicator in acute abdominal conditions. This study aimed to evaluate the role of serum lactate levels in predicting severity, need for surgical intervention, and mortality in patients with intestinal obstruction. ***Materials and Methods***: A prospective observational study was conducted on 120 patients diagnosed with intestinal obstruction admitted to a tertiary care hospital. Serum lactate levels were measured at admission. Patients were categorized into two groups: lactate <2 mmol/L and ≥2 mmol/L. Clinical parameters, operative findings, complications, and mortality were recorded. Statistical analysis was performed using SPSS version 25.0. ***Results:*** Elevated serum lactate (≥2 mmol/L) was significantly associated with bowel ischemia ($p<0.001$), need for emergency surgery ($p<0.01$), postoperative complications ($p<0.01$), and mortality ($p<0.001$). Mean lactate levels were significantly higher in patients with gangrenous bowel compared to viable bowel. ***Conclusion:*** Serum lactate is a reliable and early prognostic marker in intestinal obstruction. Elevated levels correlate strongly with bowel ischemia, surgical intervention, and mortality. Routine measurement may aid in risk stratification and timely management.

Keywords: Intestinal obstruction; Serum lactate; Bowel ischemia; Prognostic marker; Surgical emergency

INTRODUCTION

Intestinal obstruction remains one of the most frequent causes of acute abdomen requiring emergency surgical intervention. It accounts for approximately 15–20% of surgical admissions related to acute abdominal pain[1]. The condition may result from mechanical causes such as adhesions, hernias, malignancy, volvulus, or intussusception, or from functional causes such as paralytic ileus[2]. While early cases may be managed conservatively, delayed diagnosis and intervention can lead to strangulation, bowel ischemia, perforation, sepsis, and death[3].

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The major determinant of outcome in intestinal obstruction is the presence of bowel ischemia. Strangulated obstruction compromises mesenteric blood flow, leading to hypoxia, cellular dysfunction, and necrosis[4]. However, clinical signs such as tachycardia, abdominal tenderness, and leukocytosis are often nonspecific[5]. Radiological findings may not always accurately differentiate simple from strangulated obstruction[6]. Hence, reliable biochemical markers are needed for early detection of ischemia.

Serum lactate has emerged as a potential biomarker in various critical conditions including sepsis, trauma, and mesenteric ischemia[7]. Lactate is produced during anaerobic glycolysis when tissue oxygen delivery is insufficient to meet metabolic demands[8]. Elevated serum lactate reflects tissue hypoperfusion and cellular hypoxia[9].

In intestinal obstruction, mesenteric vascular compromise results in anaerobic metabolism within the intestinal wall, leading to lactate accumulation[10]. Several studies have demonstrated that elevated lactate levels correlate with bowel ischemia and increased mortality in acute abdominal conditions[11,12]. Furthermore, lactate clearance has been shown to predict survival in critically ill patients[13].

Despite growing evidence, the prognostic role of serum lactate in intestinal obstruction remains under-evaluated in developing countries. Establishing lactate as an early marker may help prioritize surgical intervention, reduce complications, and improve outcomes.

This study aims to assess the role of serum lactate as a prognostic marker in patients presenting with intestinal obstruction and to correlate its levels with bowel viability, need for surgery, postoperative complications, and mortality.

MATERIALS AND METHODS

Prospective observational study.

Study Setting

Department of General Surgery, tertiary care teaching hospital.

Study Duration

18 months.

Sample Size

120 patients diagnosed with intestinal obstruction.

Inclusion Criteria

- Age ≥18 years
- Clinical and radiological diagnosis of intestinal obstruction
- Patients providing informed consent

Exclusion Criteria

- Known chronic liver disease
- Chronic kidney disease
- Septic shock at presentation
- Diabetic ketoacidosis
- Recent major trauma
- Patients on metformin therapy
- Pregnancy

Data Collection

Detailed history and physical examination were recorded. Laboratory investigations included:

- Complete blood count
- Serum electrolytes
- Renal function tests
- Arterial blood gas analysis
- Serum lactate at admission

Serum lactate was measured using enzymatic colorimetric method. Patients were divided into:

- **Group A:** Lactate <2 mmol/L
- **Group B:** Lactate ≥2 mmol/L

Radiological evaluation included abdominal X-ray and contrast-enhanced

CT scan.

Management Protocol
Patients were managed conservatively or surgically based on clinical assessment. Intraoperative findings were recorded:

- Viable bowel
- Ischemic bowel
- Gangrenous bowel

Outcome Measures

- Need for surgical intervention
- Bowel ischemia
- Postoperative complications
- Length of hospital stay
- Mortality

Statistical Analysis
Data were analyzed using SPSS v25. Continuous variables expressed as mean ± SD. Categorical variables expressed as percentages. Chi-square test and Student's t-test used. $p<0.05$ considered statistically significant.

RESULTS

Table 1: Demographic Distribution

Variable	Frequency (n=120)	Percentage
Male	78	65%
Female	42	35%
Mean Age	52.4 ± 14.3	—

Interpretation: Intestinal obstruction was more common in males. Majority were middle-aged.

Table 2: Serum Lactate Distribution

Lactate Level	Frequency	Percentage
<2 mmol/L	70	58%
≥2 mmol/L	50	42%

Interpretation: 42% patients had elevated lactate levels at admission.

Table 3: Lactate vs Bowel Ischemia

Lactate Level	Viable Bowel	Ischemic/Gangrenous	p-value
<2 mmol/L	65	5	
≥2 mmol/L	10	40	<0.001

Interpretation: Strong association between elevated lactate and bowel ischemia.

Table 4: Lactate vs Surgical Intervention

Lactate Level	Conservative	Surgical	p-value
<2 mmol/L	45	25	
≥2 mmol/L	5	45	<0.01

Interpretation: Elevated lactate significantly predicted need for surgery.

Table 5: Lactate vs Postoperative Complications

Lactate Level	Complications Present	No Complications	p-value
<2 mmol/L	8	62	
≥2 mmol/L	28	22	<0.01

Interpretation: Higher complication rate in elevated lactate group.

Table 6: Lactate vs Mortality

Lactate Level	Mortality	Survival	p-value
<2 mmol/L	1	69	
≥2 mmol/L	12	38	<0.001

Interpretation: Mortality significantly higher in patients with lactate ≥2 mmol/L.

DISCUSSION

This study demonstrates a strong correlation between elevated serum lactate levels and adverse outcomes in intestinal obstruction. Lactate levels ≥2 mmol/L were significantly associated with bowel ischemia, need for emergency surgery, postoperative complications, and mortality.

Similar findings were reported by Yamamoto et al., who showed lactate as an independent predictor of bowel necrosis[14]. Nuzzo et al. demonstrated elevated lactate correlating with intestinal ischemia severity[15]. In acute mesenteric ischemia, lactate >2 mmol/L has been associated with increased mortality[16].

The pathophysiological basis lies in reduced mesenteric perfusion leading to anaerobic glycolysis and lactate accumulation[17]. Elevated lactate reflects systemic hypoperfusion and cellular dysfunction[18].

Furthermore, studies in emergency surgery settings have shown admission lactate levels predict ICU admission and mortality[19]. Lactate clearance has also been emphasized as a dynamic prognostic marker[20].

Our findings align with recent meta-analyses indicating lactate as a sensitive marker of strangulated obstruction[21]. However, lactate alone should not replace clinical judgment, as early ischemia may not always produce significant elevation[22].
Routine measurement is inexpensive and rapidly available, making it a practical tool in emergency departments.

CONCLUSION

Serum lactate is a valuable prognostic biomarker in intestinal obstruction. Elevated levels correlate strongly with bowel ischemia, surgical intervention, complications, and mortality. Early assessment may facilitate timely surgical decision-making and improve patient outcomes.

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