

Original Research Article

A Study of Serum Amylase Level and Serum Level of Seromuscular Enzymes (SGOT, Ldh, CPK) as A Diagnostic Index of Necrosis and Gangrene of Intestine in a Case of Acute Mechanical Small Intestinal Obstruction: An Observational Study**Shobhik Chakraborty¹, Kaushik Kar², Debabrata Ray³, Debangshu Bhanja Choudhury⁴**¹*RMO, Department of General Surgery, Midnapore Medical College and Hospital, PaschimMedinipur, West Bengal, India*²*Associate Professor, Department Of Biochemistry, Calcutta National Medical College &Hospital, Kolkata, West Bengal, India*³*Professor, Department of General Surgery, Bankura Sammilani Medical College & Hospital, Bankura, West Bengal, India*⁴*Assistant Professor, Department of General Surgery, Calcutta National Medical College & Hospital, Kolkata, West Bengal, India***Received: 16-04-2021 / Revised: 16-05-2021 / Accepted: 11-06-2021****Abstract**

Introduction: Intestinal obstruction is a common surgical emergency that accounts for at least 20% of all admissions to a surgical service (1). It is any impedence to normal flow of bowel contents and can be classified largely as dynamic (mechanical) or a dynamic (functional) obstruction.(2,3) Dynamic obstruction is a mechanical problem caused by a physical blockage which can either be extra luminal (extrinsic), mural (intrinsic) or intraluminal. **Materials and Methods:** The Inpatient Department of the Department of General Surgery, Calcutta National Medical College and Hospital, 24 Gorachand Road, Kolkata-700014. Patients admitted under the Department of General Surgery in Calcutta National Medical College and Hospital, Kolkata, diagnosed as acute mechanical intestinal obstruction clinically, radiologically by Straight X-Ray abdomen and intra operatively by direct inspection on exploration of abdomen. **Results:** Out of 77 male patients with acute mechanical small bowel obstruction, 22 patients had gangrene (28.571%). Of the 23 female patients in our study 5 patients had gangrene (21.739%). The mean value of serum amylase, serum LDH, serum CPK, serum SGOT were found statistically significantly increased in patients with gangrenous gut in comparison to patients with normal gut. Crosstab analysis was also done for serum marker level taking highest normal value range in patients with evidence of gangrene of gut and in patient with non-gangrenous gut. These data was also found statistically significant. **Conclusion:** Acute intestinal obstruction is an important surgical emergency with significant morbidity and mortality. From this study it is evident that increased pre operative serum Amylase, SGOT, CPK, LDH strongly indicates an underlying gangrenous change. These tests are less invasive, cost effective and easily available diagnostic tool to diagnose bowel ischemia/gangrene. Hence these are more useful in centres where the diagnostic facilities are limited.

Keywords: Intestinal obstruction, SGOT, CPK, LDH.

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Introduction

Intestinal obstruction is a common surgical emergency that accounts for at least 20% of all admissions to a surgical service. It is any impedence to normal flow of bowel contents and can be classified largely as dynamic (mechanical) or a dynamic (functional) obstruction. Dynamic obstruction is a mechanical problem caused by a physical blockage which can either be extra luminal (extrinsic), mural (intrinsic) or intraluminal[1,2].

Mechanical obstruction often requires corrective surgery unlike functional obstruction, which mainly relies on conservative management except in certain exceptions. The most important concern regarding acute small bowel obstruction is its progression to strangulation, causing gangrene and perforation due to the difficulty in distinguishing simple from strangulation obstruction[3]. Delay in

surgical treatment may cause serious complications like electrolyte imbalance, dehydration, bowel gangrene, peritonitis, septicemia, fever and also death. Sepsis is much higher in the strangulated group (18.4% as against 1.4%) and wound infection is also more common[4]. In spite of a marked increase in diagnostic capabilities, it is still difficult to differentiate between simple obstruction, which may resolve with conservative measures, and bowel strangulation, where delay in surgery can lead to catastrophe. Therefore, accurate and prompt recognition of bowel strangulation is important in deciding the need for early emergency surgery in such patients[5]. Timely diagnosis and surgical intervention for intestinal ischemia are challenging clinical problems. A serum marker for early, potentially reversible intestinal ischemia would be valuable in the management of this condition[6].

The study is designed to predict the importance of serum amylase level and serum level of different seromuscular enzymes (CPK, LDH, SGOT) in a case of acute mechanical intestinal obstruction.

Correspondence*Dr.ShobhikChakraborty**

RMO, Department of General Surgery, Midnapore Medical College and Hospital, Paschim Medinipur, West Bengal, India.

E-mail: cshobhik@yahoo.com

Materials and Methods

Study Area: The Inpatient Department of the Department of General Surgery, Calcutta National Medical College and Hospital, 24 Gorachand Road, Kolkata-700014

Study Population: Patients admitted under the Department of General Surgery in Calcutta National Medical College and Hospital, Kolkata, diagnosed as acute mechanical intestinal obstruction clinically, radiologically by Straight X-Ray abdomen and intra operatively by direct inspection on exploration of abdomen.

Study Period: One and half year (January 2016 to June 2017).

Sample Size: As per feasibility and availability 100 patients were taken prior to an informed consent satisfying inclusion and exclusion criteria.

Sample Design: Case Series

Study Design: Observational cross sectional study.

Parameters to be Studied:**Preoperative Parameters-**

- Age: <20 years, 20-40 years, >40 years
- Sex: Male/Female
- Preexisting co morbid conditions-
 1. Pancreatitis
 2. Mumps , other salivary gland infection
 3. Respiratory diseases
 4. Renal diseases
 5. Hypertension
 6. Diabetes mellitus
 7. Liver, neuromuscular or cardiac disorder
 8. Chronic alcoholism
 9. Smoking
- Signs and symptoms
 1. Pain
 2. Vomiting
 3. Abdominal distension
 4. Constipation
 5. Fever
 6. Tachycardia (pulse>100/minute)
 7. Hypotension (SBP<100 mm of Hg)
 8. Tachypnoea (Respiratory rate >20/minute)
- Radiological investigations
 1. Multiple air fluid levels on abdominal X-Ray
- Blood investigations
 1. Hemoglobin, Total count, Differential count, ESR
 2. Serum Sodium, Potassium
 3. Serum Urea, Creatinine
 4. Serum Amylase
 5. Serum SGOT, LDH, CPK

Operative Parameters

- Site of obstruction- small bowel/ large bowel
- Type of obstruction- intraluminal/intramural/extramural
- Cause of obstruction-
- Presence of perforation &/or peritonitis (peritoneal exudates)
- Presence of necrosis and gangrene on inspection and palpation of gut on table.

Post Operative Parameters

- Histopathology report of tissue relevant to the obstruction

Study Tools:

- a. Pre-designed, pre tested semi structured schedule with both close and open ended questionnaire.
- b. Clinical examination findings
- c. Blood investigation reports (Serum Amylase, Serum SGOT, Serum LDH, Serum CPK)

- d. Radiology reports (Chest X-Ray PA view in erect posture, Abdominal X-Ray in erect posture with both dome of diaphragm)
- e. Operative notes (preoperative macroscopic findings, preoperative patient parameters, preoperative events if any)
- f. Histopathological findings of the relevant tissue taken from the site of obstruction.

Study Technique:

- i. Interview
- ii. Clinical examination
- iii. Study of the investigational reports

A. Inclusion Criteria :

- Patients presenting with history and signs suggestive of acute intestinal obstruction.
- Patients of whose straight X-Ray abdomen shows multiple air-fluid level.
- Patients on whose exploration of abdomen definite mechanical obstruction of small bowel is found.

B. Exclusion Criteria:

- Patients with present or recent past history of Mumps infection or salivary gland infection.
- Patients with present or recent past history of Pancreatitis or any other pancreatic disease.
- Patients with present or recent past history of cardiac elements like myocardial infarction, myocarditis etc. and myositis and rhabdomyolysis.
- Patients with present or recent past history of malignant hyperthermia and neuroleptic malignant syndrome.
- Patients with present or recent past history of hepatitis, cirrhosis or any liver disorder.
- Patients taking drugs causing alteration of serum amylase, SGOT, CPK, LDH
- Patients on whose exploration of abdomen no mechanical obstruction was found.
- Patients on whose exploration of abdomen, gross pathology of pancreas or pancreatic duct was found.

All cases were interviewed after obtaining an informed consent from them. Confidentiality and anonymity was assured to the study subjects. Necessary permission was obtained from institutional ethics committee. The cases were studied in terms of clinical presentation, radiological investigations, biochemical investigation, operative and post operative course.

Sample Collection and Processing: 5 ml of blood were collected from the study population. The blood samples were centrifuged at 3000 rpm for 10-20 mins and serum was obtained. Samples were stored in +4°C until analysis during the same day.

Methods for Test Parameters: Serum amylase was measured by Direct substrate method (Beacon diagnostics). (S) LDH was measured by SCE Pyruvate-Lactate method (Sclavo diagnostics international). S. SGOT by kinetic enzymatic method (Sclavo diagnostics international). (S) CPK by DGKC and IFCC method (Sclavo diagnostics international).

i) Instrument Used: Automatic analyser (Konelab- Indiko systems).

ii) Quality Control: i) The instruments and reagents are validated by concerned authority. ii) The results are subjected to co-efficient of variation (cv).

iii) Plan for analysis of data: All recorded data is analyzed with suitable diagrams, figures, tables and findings are discussed in details to draw appropriate conclusions using standard statistical analysis.

Results

The present study included 100 patients with acute mechanical small intestinal obstruction diagnosed clinically or with X-Ray and with intra operative findings.

Table 1: Age wise distribution of patients (n=100)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<20	6	6.0	6.0	6.0
	20-40	39	39.0	39.0	45.0
	>40	55	55.0	55.0	100.0
	Total	100	100.0	100.0	

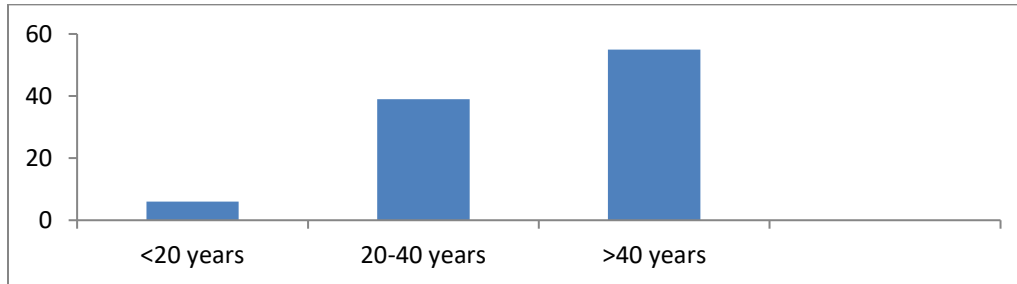


Fig 1: Age wise distribution of patients of acute mechanical small intestinal obstruction.

The above table shows that most of the patient of acute small bowel mechanical intestinal obstruction presented are above 40 years of age. (55%) followed by 39 % patients of 20-40 years of age. Only 6 % patients were below 20 years of age.

Table 2: Sex wise distribution of patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	23	23.0	23.0	23.0
	M	77	77.0	77.0	100.0
	Total	100	100.0	100.0	

In this study out of total patients of 100, 77 are male patients and 33 are female patients.

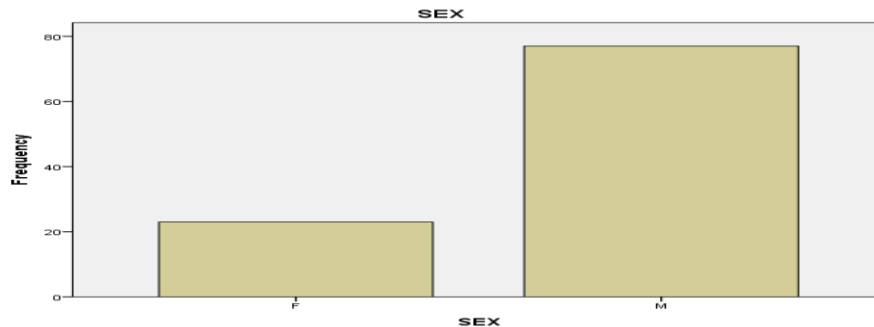


Fig 2: Sex wise distribution of patients of acute mechanical small intestinal obstruction.

Table 3: Sex wise distribution of patients with gangrene

	Total	Gangrene	Percent	Valid percent
Male	77	22	28.571	28.571
Female	23	5	21.739	21.739

Out of 77 male patients with acute mechanical small bowel obstruction, 22 patients had gangrene (28.571%). Of the 23 female patients in our study 5 patients had gangrene (21.739%).

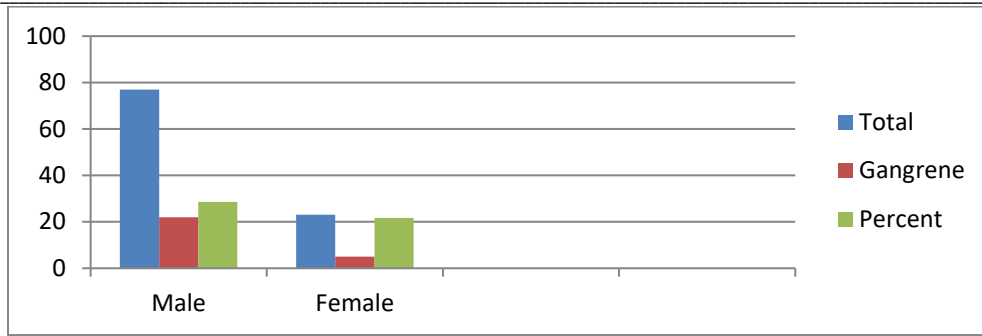


Fig 3: Sex wise distribution of patients of acute mechanical small intestinal obstruction with gangrene.

Table 4: Co morbidity (n=100)

		Frequency	Percent	Valid Percent
Valid	Hypertension	3	3.0	3.0
	COPD	3	3.0	3.0
	Smoking	55	55.0	55.0
	Alcoholism	22	22.0	22.0

In our study smoking was found to be most common co morbidity in our patient present in 55% of patients (n=100). Followed by

alcoholism in 22 %, and COPD and Hypertension each in 3 % patients were present.

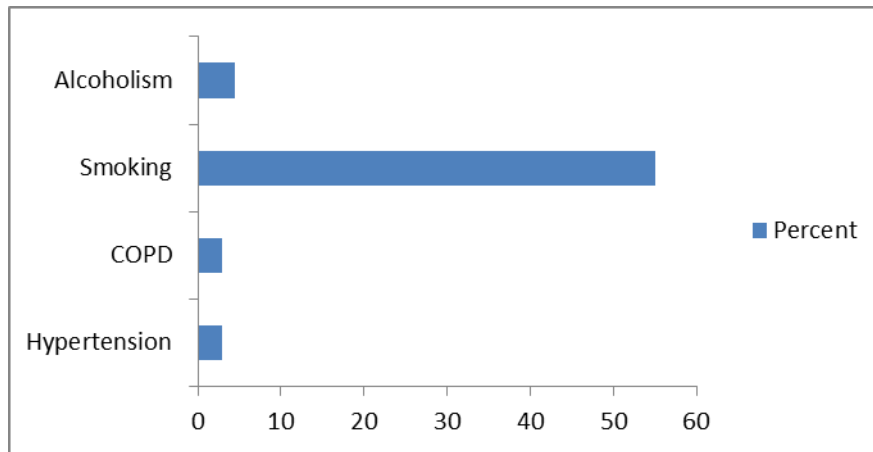


Fig 4: Co morbidity of patients of acute mechanical small intestinal obstruction

Table 5: presenting symptom of patients (n=100)Clinical feature

		Frequency	Percent	Valid Percent
Valid	Pain	73	73.0	73.0
	Distension	74	74.0	74.0
	Constipation	66	66.0	66.0
	Vomiting	34	34.0	34.0

In our study of 100 patients of acute mechanical small bowel obstruction pain and distension were most common presenting

symptom in 73% and 74 % respectively followed by constipation and vomiting in 66 % and 34 % patients respectively.

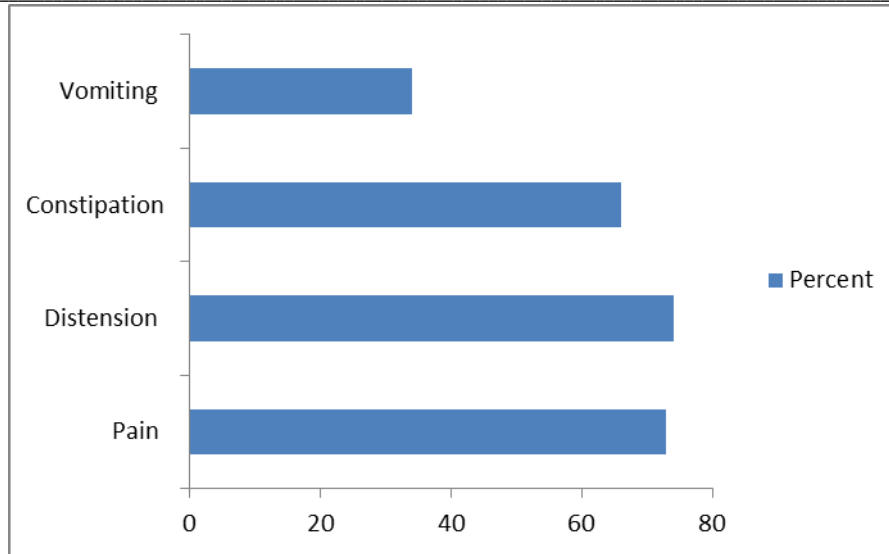


Fig 5: Clinical symptoms of patients of acute mechanical small intestinal obstruction

Table 6: Straight X-ray of abdomen of patients (n=100)

		X-RAY			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	AFL	93	93.0	93.0	93.0
	N	7	7.0	7.0	100.0
	Total	100	100.0	100.0	

The above table shows out of 100 patients of acute mechanical small bowel obstruction 93 patients had multiple air fluid level (AFL) in straight X-ray abdomen in erect posture.

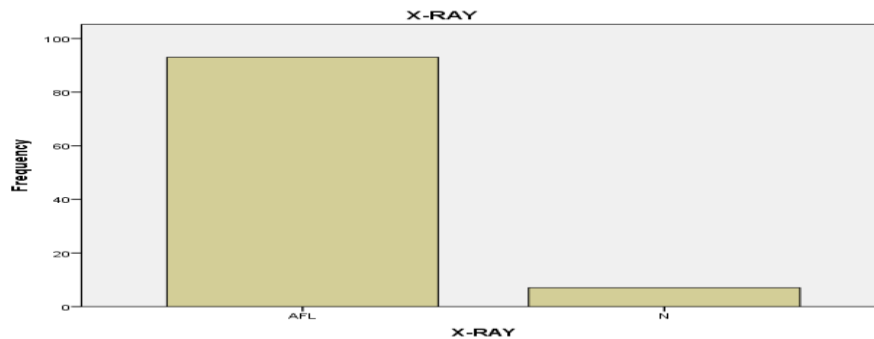


Fig 6: Finding of straight X-Ray abdomen in erect posture of patients of acute mechanical small intestinal obstruction

Table 7 :site of obstruction in acute mechanical small intestinal obstruction (n=100)

		SIT			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ILEUM	80	80.0	80.0	80.0
	JEJUNUM	20	20.0	20.0	100.0
	Total	100	100.0	100.0	

The above table shows that 80 out of 100 patients of acute mechanical small intestinal obstruction have obstruction at ileum. 20 patients had jejuna obstruction.

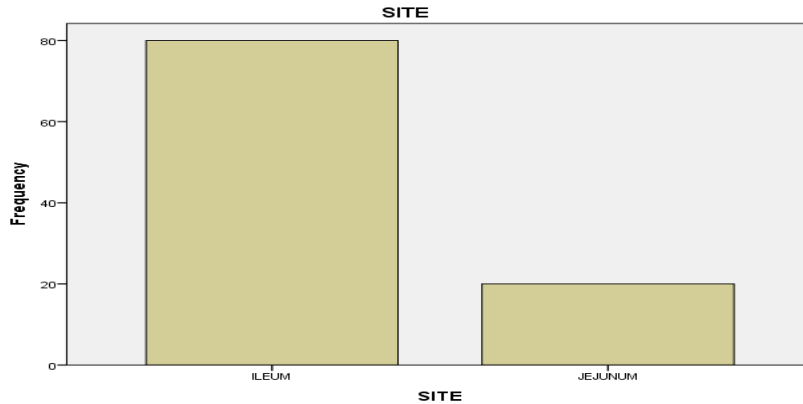


Fig 7: Site of obstruction in acute mechanical small intestinal obstruction

Table 8: Type of obstruction in acute mechanical small intestinal obstruction (n=100)

		Type			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	IL	0	0.0	0.0	0.0
	IM	17	17.0	17.0	17.0
	EL	83	83	83	100.0
	Total	100	100.0	100.0	

In our study of n=100 patients of acute mechanical small intestinal obstruction 83% were extraluminal obstruction followed by 17 % intramural obstruction. No patients had intraluminal obstruction.

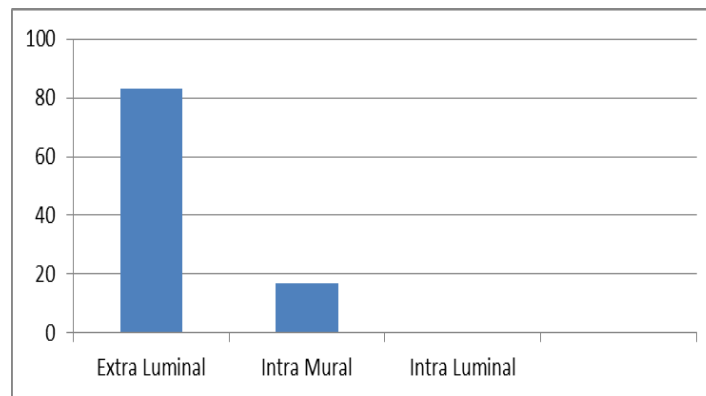


Fig 8: Type of obstruction in acute mechanical small intestinal obstruction

Table 9: Cause of obstruction in acute mechanical small intestinal obstruction (n=100)

		CAUSE			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adhesion	20	20.0	20.0	20.0
	Band	27	27.0	27.0	47.0
	Meckels Diverticulum	7	7.0	7.0	54.0
	Obstructed Inguinal Hernia	33	33.0	33.0	87.0
	Obstructed Incisional Hernia	3	3.0	3.0	90.0
	Stricture	10	10.0	10.0	100.0
	Total	100	100.0	100.0	

The above table shows etiological distribution of the patients of acute mechanical small bowel obstruction. Out of n=100 patients 33 % have obstructed inguinal hernia, 27 % have intra abdominal band, 20 % have adhesion, 10 % have stricture, 7% patients have meckel’s diverticulum as the cause of obstruction and 3 % have obstructed incisional hernia.

The most common cause of obstruction in our study is adhesion and band, if we consider adhesion & band as single etiological classification (47% patients). Next common cause is obstructed hernia in 36 % patients.

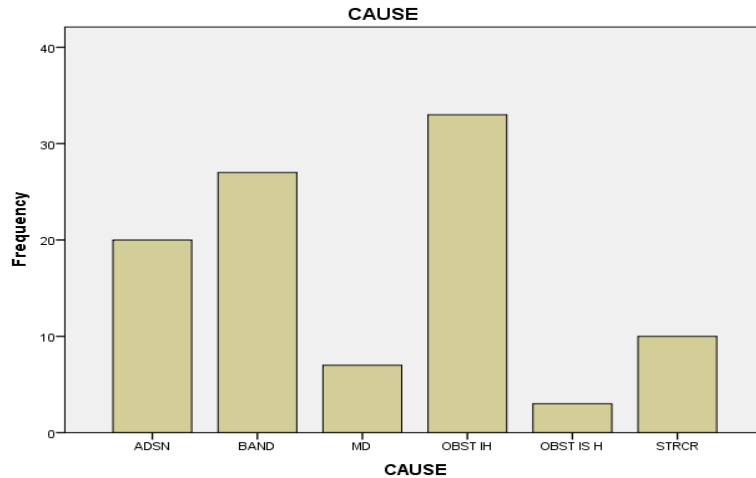


Fig 9: Cause of obstruction in acute mechanical small intestinal obstruction

Table 10: Peritonitis (n=100)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	80	80.0	80.0	80.0
	YES	20	20.0	20.0	100.0
	Total	100	100.0	100.0	

In our study of n=100 patients, 20 % patients have peritonitis as a complication of acute mechanical small intestinal obstruction.

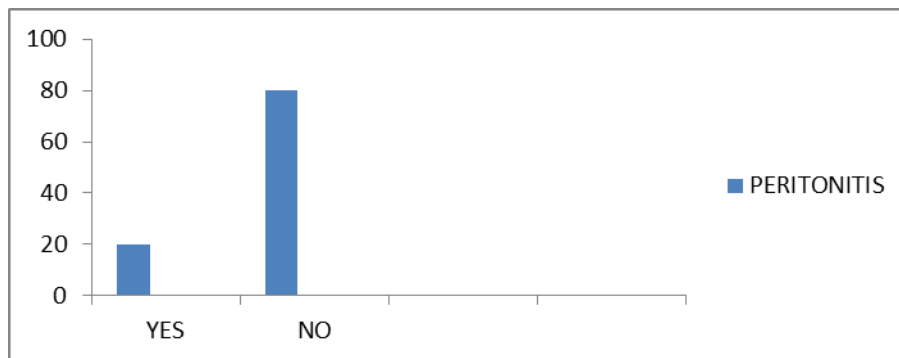


Fig 10: Peritonitis associated with acute mechanical small intestinal obstruction

Table 11: Intra Operative GUT (n=100)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Gangrene	27	27.0	27.0	27.0
	Normal	73	73.0	73.0	100.0
	Total	100	100.0	100.0	

The above table showed 27% patients of acute small bowel obstruction had evidence of gangrene on observation of gut during operation. (n=100)

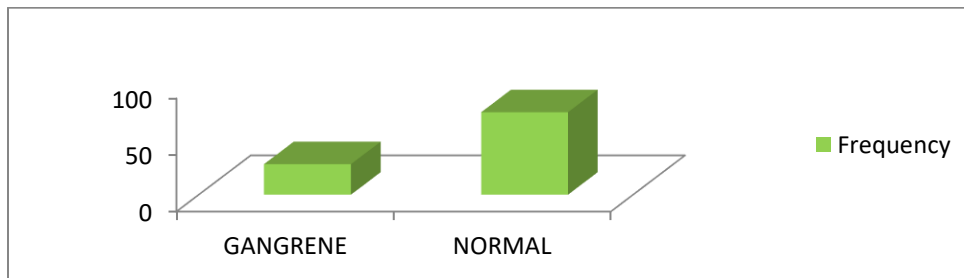


Fig 11: Gangrene associated with acute mechanical small intestinal obstruction.

Table 12: Operative Procedure (n=100)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adhesiolysis	17	17.0	17.0	17.0
	Release of Band	20	20.0	20.0	37.0
	Repair of Hernia	33	33.0	33.0	70.0
	Resection of GUT	27	27.0	27.0	97.0
	Stricturoplasty	3	3.0	3.0	100.0
Total		100	100.0	100.0	

In our study n=100 patients of acute small bowel intestinal obstruction undergoing emergency exploration, 17% patient were relieved with adhesiolysis only, 20 % patient needed release of intra

abdominal band. 33% patient needed repair of hernia and 27 % of patient needed resection of bowel segment. Stricturoplasty was done in 3 % of patient.

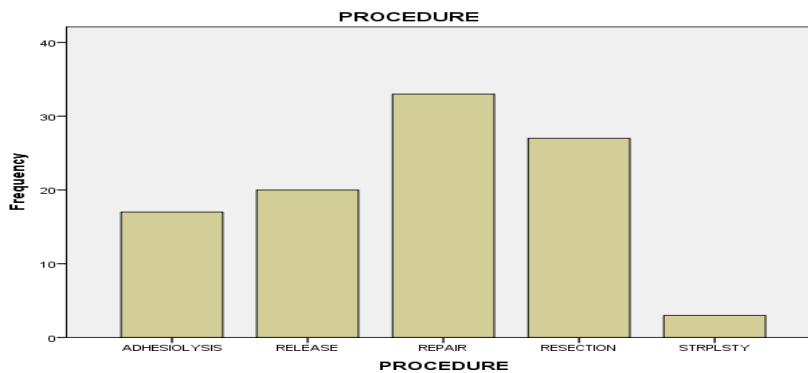


Fig 12: Operative procedure for acute mechanical small intestinal obstruction

Statistical Analysis

Table 13a: Serum Amylase Level in respect to presence and absence of bowel gangrene (n=100)

Group Statistics					
Intra OP GUT		N	Mean	Std. Deviation	Std. Error Mean
Amylase(U/L)	Normal	73	40.74	23.077	2.701
	Gangrene	27	75.30	17.189	3.308

The mean value of serum amylase was 40.74 U/L in patients with normal gut (n=73) with standard deviation of 23.077. Whereas mean

value was 75.30 U/L in patients with gangrenous gut (n=27) with standard deviation of 17.189.

Table 13b: Test for significance of Serum Amylase level (n=100)

Levene's Test for Equality of Variances		
	t	Sig. (2-tailed)
Amylase(U/L)	-8.261	.0001

The value of serum amylase was found statistically significant with respect to presence of bowel gangrene.

Table 14a: Serum LDH Level in respect to presence and absence of bowel gangrene (n=100)

Group Statistics					
Intra OP GUT		N	Mean	Std. Deviation	Std. Error Mean
LDH (U/L)	Normal	73	495.03	71.471	8.365
	Gangrene	27	948.52	184.405	35.489

The mean value of serum LDH was 495.03 U/L in patients with normal gut (n=73) with standard deviation of 71.471. Whereas mean

value was 948.52 U/L in patients with gangrenous gut (n=27) with standard deviation of 184.405.

Table 14b: Test for significance of Serum LDH level (n=100)

Levene's Test for Equality of Variances			
	t	Sig. (2-tailed)	
LDH (U/L)	Equal variances assumed	-12.4544	.0001

The value of serum LDH was found statistically significant with respect to presence of bowel gangrene.

Table 15a: Serum CPK Level in respect to presence and absence of bowel gangrene (n=100)

Group Statistics					
Intra OP GUT		N	Mean	Std. Deviation	Std. Error Mean
CPK (U/L)	Normal	73	588.01	120.233	14.072
	Gangrene	27	1378.67	669.960	128.934

The mean value of serum CPK was 588.01 U/L in patients with normal gut (n=73) with standard deviation of 120.233. Whereas

mean value was 1378.67 U/L in patients with gangrenous gut (n=27) with standard deviation of 669.960.

Table 15b: Test for significance of Serum CPK level (n=100)

		Levene's Test for Equality of Variances	
		t	Sig. (2-tailed)
CPK (U/L)	Equal variances assumed	-6.0998	.0001

The value of serum CPK was found statistically significant with respect to presence of bowel gangrene.

Table 16a: Serum SGOT Level in respect to presence and absence of bowel gangrene (n=100)

Group Statistics					
	INTRA OP GUT	N	Mean	Std. Deviation	Std. Error Mean
SGOT (U/L)	Normal	73	52.26	23.49	2.75
	Gangrene	27	93.04	100.77	19.76

The mean value of serum SGOT was 52.26 U/L in patients with normal gut (n=73) with standard deviation of 23.49. Whereas mean

value was 93.04 U/L in patients with gangrenous gut (n=27) with standard deviation of 19.76.

Table 16b: Test for significance of Serum SGOT level (n=100)

		Levene's Test for Equality of Variances	
		t	Sig. (2-tailed)
SGOT (U/L)	Equal variances assumed	-2.123	.044
	Equal variances not assumed		

The value of serum SGOT was found statistically significant with respect to presence of bowel gangrene.

Analysis of Sex Variation

Table 17: Serum enzymes level in respect to sex variation (n=100)

Report					
	Sex	Amylase (U/L)	LDH (U/L)	CPK (U/L)	SGOT (U/L)
F	Mean	46.09	588.43	732.52	67.30
	N	23	23	23	23
	Std. Deviation	27.670	237.178	464.684	68.010
M	Mean	51.26	626.14	822.09	61.74
	N	77	77	77	77
	Std. Deviation	26.219	232.319	514.777	54.198
Total	Mean	50.07	617.47	801.49	63.02
	N	100	100	100	100
	Std. Deviation	26.507	231.494	502.842	57.344

Table 18: Test for significance of Serum enzymes level in respect to sex variation (n=100)

		Levene's Test for Equality of Variances				
		F	Sig.	t	df	Sig. (2-tailed)
Amylase(U/L)	Equal variances assumed	.025	.874	-.191	98	.849
LDH (U/L)	Equal variances assumed	.409	.524	-1.380	98	.171
CPK (U/L)	Equal variances assumed	.358	.551	-.825	98	.411
SGOT (U/L)	Equal variances assumed	.290	.591	.407	98	.685

All four serum marker, amylase, LDH, CPK, SGOT were separately analysed in male and female patients. The values were not statistically significant with variation of sex.

Crosstabulation with Normal Values

Table 19a: Crosstab with serum amylase level (n=100)

Crosstab Amylase				
		Amylase >90 U/L		Total
		I	N	
INTRA OP GUT	GANGRENE	7	20	27
	NORMAL	0	73	73
Total		7	93	100

Table 19b: Test for significance of serum amylase level (n=100)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.4	1	.000

Crosstab analysis was done for serum amylase level taking highest normal value as 90 U/L. Out of n=27 patients with evidence of gangrene of gut, 7 patients had increased level of s. amylase than

upper limit. But none of n=73 patient with non-gangrenous gut had increased serum amylase level. This data was statistically significant.

Table 20a: Crosstab with serum CPK level (n=100)

Cross tabulation CPK				
Count				
		Intra OP GUT		Total
		Gangrene	Normal	
CPK >170 U/L	I	27	70	97

	N	0	3	3
Total		27	73	100

Table 20b: Test for significance of serum CPK level (n=100)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.14	1	.285

Crosstab analysis was done for serum creatinine phosphokinase (CPK) level taking highest normal value as 170 U/L. Out of n=27 patients with evidence of gangrene of gut, all patients had level of serum CPK increased than upper limit. But of n=73 patient with non

gangrenous gut 70 had increased serum CPK level. This data was not statistically significant.

Table 21a: Crosstab with serum SGOT level (n=100)

Count				
		Intra OP GUT		Total
		Gangrene	Normal	
10-37 U/L	I	27	50	77
	N	0	23	23
Total		27	73	100

Table 21b: Chi-Square Tests for significance of serum SGOT level (n=100)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.0	1	.001

Crosstab analysis was done for Serum glutamic oxaloacetic transaminases (SGOT) level taking normal value as 10-37 U/L. Out of n=27 patients with evidence of gangrene of gut, all patients had

level of serum SGOT increased than upper limit. But of n=73 patient with non gangrenous gut 50 had increased serum SGOT level. This data was statistically significant.

Table 22a: Crosstab with serum LDH level (n=100)

Count				
		Intra OP GUT		Total
		Gangrene	Normal	
225-450 U/L	I	27	64	91
	N	0	9	9
Total		27	73	100

Table 22b: Chi-Square Tests for significance of serum SGOT level (n=100)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.66	1	.056

Crosstab analysis was done for Serum *Lactate dehydrogenase (LDH)* level taking normal value as 225-450 U/L. Out of n=27 patients with evidence of gangrene of gut, all patients had level of S. LDH increased than upper limit. But of n=73 patient with non

gangrenous gut 64 had increased serum LDH level. This data was statistically significant.

Analysis Of Peritonitis

Table 23: Analysis of Serum Markers with Presence of Peritonitis. (n=100)

	INTRA OP GUT	N	Mean
AMYLASE(U/L)	Normal	73	40.74
	Gangrene	27	75.30
	Peritonitis	20	73.15
LDH (U/L)	Normal	73	495.03
	Gangrene	27	948.52
	Peritonitis	20	965.60
CPK (U/L)	Normal	73	588.01
	Gangrene	27	1378.67
	Peritonitis	20	1444.8
SGOT (U/L)	Normal	73	52.26
	Gangrene	27	93.04
	Peritonitis	20	91.4

Analysis of the four serum markers with presence of peritonitis in operative findings shows increase of mean level of s. LDH and CPK in comparison to serum marker in patient with non gangrenous gut.

But the increase of s. amylase and SGOT in patients with peritonitis was at par with patients of gangrene without peritonitis.

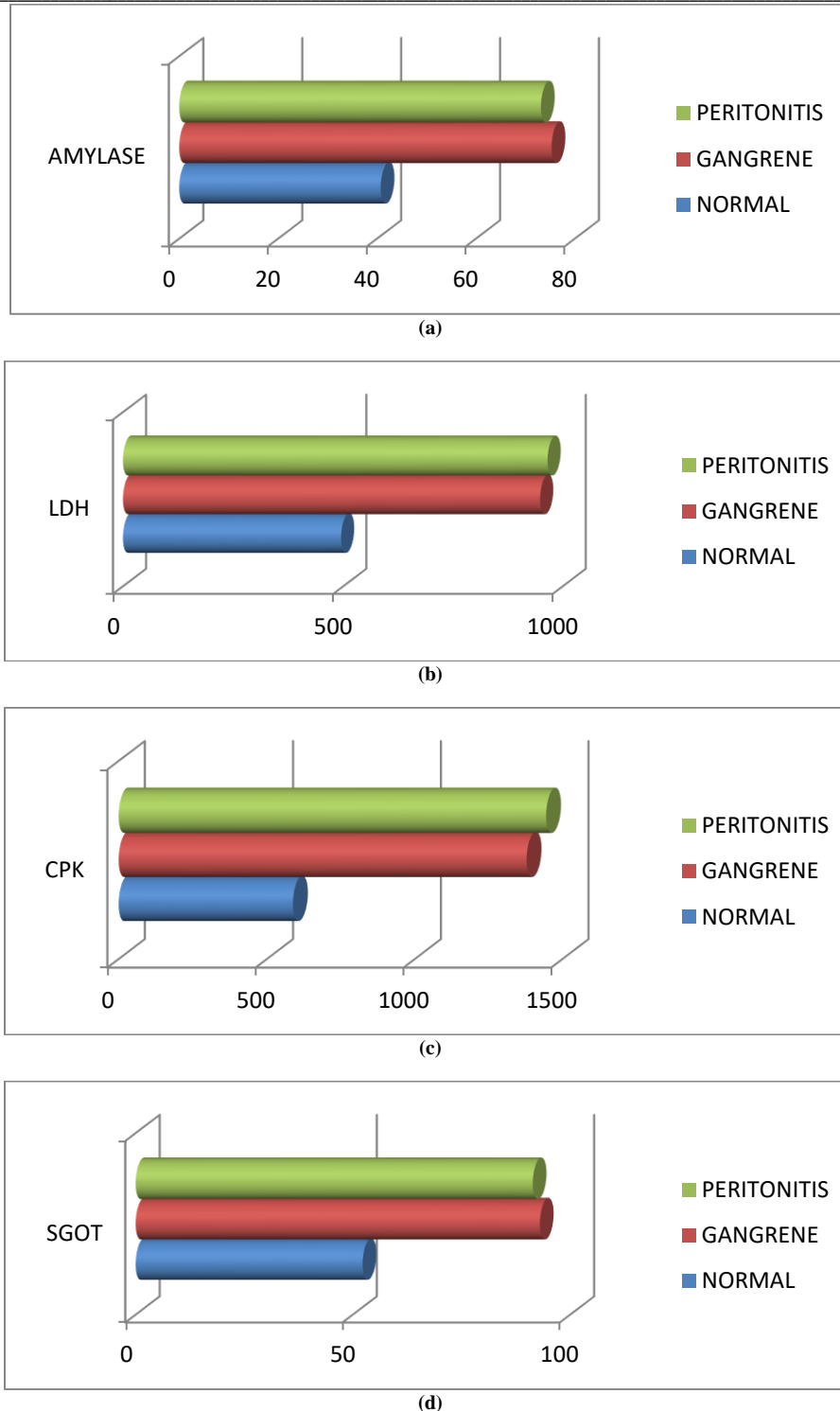


Fig 24: Analysis of serum markers, amylase (a), LDH (b), CPK (c), SGOT (d) in patients with normal gut, with gangrenous gut and with presence of peritonitis

**Mann-Whitney U Test For Mean
Hypothesis Test Summary**

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of AMYLASE(U/L) is the same across categories of INTRA OP GUT.	Independent-Samples Mann-Whitney U Test	.054	Retain the null hypothesis.
2	The distribution of LDH (U/L) is the same across categories of INTRA OP GUT.	Independent-Samples Mann-Whitney U Test	.013	Reject the null hypothesis.
3	The distribution of SGOT (U/L) is the same across categories of INTRA OP GUT.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.
4	The distribution of CPK (U/L) is the same across categories of INTRA OP GUT.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Mann-Whitney U Test for significance was done. In the test null hypothesis was rejected in case of serum LDH, SGOT & CPK. But null hypothesis was retained in case of serum amylase level.

Discussion

Gangrenous bowel recognized as a potential cause of mortality. It occurs due to various causes. This study was undertaken with a notion to identify the patients with features of acute intestinal obstruction who are developing bowel gangrene at the earliest. If infarction of the bowel could lead to a loss of enzyme from the intestinal mucosa, there should be a significant increase in the amylase content of the intraluminal contents as well as in the systemic and portal veins, due to transudation across permeable bowel and absorption into the blood stream[7]

The present study was undertaken to evaluate the role of serum markers Amylase, LDH, SGOT, CPK levels in the case of bowel ischemia. Above mentioned serum markers were evaluated in the patients preoperatively. In our study total 100 patients of acute mechanical small intestinal obstruction were diagnosed clinically or from straight x-ray of abdomen in erect posture and by direct observation during operation. Diagnosis of gangrene was made by finding during operation or by post operative histopathology report[8].

Intestinal obstruction was found more common in elderly age group of more than 40 years of age (55%). Earlier studies also supported the elderly predisposition of gangrenous intestinal obstruction. Male patients were 77%, which showed a male preponderance (figure 4). This compares to an earlier study by Ngugi J.K.; 1999 on intestinal obstruction from adhesions at KNH where the ratio was 3:1. The most common cause of obstruction was adhesion band in 44% patients followed by obstructed hernia in 36% patients. Previous studies also showed similar etiological distribution.

Out of total n=100 patients of acute mechanical small bowel obstruction, 27 patients had evidence of gangrene of gut as observed during operation &/or in post operative histopathology. 20 patients had evidence of peritonitis as a complication of intestinal obstruction. This higher proportion of patients with gangrene and peritonitis may be due to delayed presentation of the patients in this tertiary care centre[9].

In our study mean value of serum amylase in non gangrenous bowel was 40.74 U/L and in strangulated gut mean was 75.30 U/L. These values were statistically significant (sig 0.0001). Normal higher range of serum amylase is 90 U/L according to the standard method taken. Out of n=27 patients with evidence of gangrene of bowel, 7 patients had increased serum amylase level. When comparison of serum amylase value done between gangrenous and non gangrenous bowel with chi square test, significant difference (p<0.000) was obtained. Similar result was found in previous studies also[10].

Several mechanisms have been postulated for raise of serum amylase level in small bowel obstruction. It has been postulated that the vomiting of intestinal obstruction elevates the intraduodenal pressure, which in turn is transmitted to the pancreatic duct, thus causing a mild pancreatitis. Large amounts of pancreatic amylase may be absorbed from the lumen of an obstructed loop of gut, since such small intestine is more permeable than normal bowel. (79)The hemoconcentration of intestinal obstruction can be only an insignificant factor in the observed blood amylase rises. The succus entericus, secreted from the crypts of Lieberkuhn, contains an amylase which is most likely identical with that of the pancreas and salivary glands. Most of the enzymes of the succus entericus normally enter the small intestine by a method involving mucosal disintegration; the enzyme-containing cells of the crypts of Lieberkuhn are shed into the lumen of the bowel where they disintegrate and release their ferments. In strangulated obstructions of the small intestine, there is necrosis of large areas of the mucosa. The originally empty strangulated loop becomes filled with a hemorrhagic fluid containing numerous desquamated epithelial cells. Simultaneously, large amounts of similar, but acellular, fluid accumulate in the peritoneal cavity. These bowel contents and peritoneal fluids often have high levels of amylase even higher than those in the animal's blood. From the lumen, the amylase passes through the necrotic, permeable bowel wall into the peritoneal cavity; from the peritoneal cavity it readily reaches the blood stream. In our study mean value of serum CPK in non gangrenous bowel was 588.01U/L and in strangulated gut mean was 1378.67U/L. These values were statistically significant (sig 0.0001). Normal reference range of total serum CPK is up to 170 U/L standard procedure followed. Out of n=27 patients with evidence of gangrene of bowel,

all patients had increased total serum CPK level than upper reference. Cross tabulation of mean value was not significant ($p < 0.285$). Mean value of serum SGOT in non gangrenous bowel was 52.26 U/L and in strangulated gut mean was 93.04 U/L. These values were statistically significant ($p < 0.044$). Normal reference range of serum SGOT is < 37 U/L in standard method followed. Out of $n=27$ patients with evidence of gangrene of bowel, all patients had increased serum SGOT level than reference. Cross tabulation of mean value shows difference in significance ($p < 0.001$). Similar result was found in previous studies also. In another clinical study, Sachs and coworkers reported that serum SGOT, LDH, and CPK levels were significantly elevated in patients with nonocclusive ischemia and less elevated in patients with arterial or venous thrombosis.

Conclusion

Acute intestinal obstruction is an important surgical emergency with significant morbidity and mortality. From this study it is evident that increased pre operative serum Amylase, SGOT, CPK, LDH strongly indicates an underlying gangrenous change. These tests are less invasive, cost effective and easily available diagnostic tool to diagnose bowel ischemia/gangrene. Hence these are more useful in centres where the diagnostic facilities are limited.

The pre-operative estimation of serum Amylase, SGOT, CPK, 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 an 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.

Conflict of Interest: Nil

Source of support: Nil

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