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# Clinical Predictors of mortality in Acute Mesenteric Ischemia

**Nagat Moaz Hamza Youssef Elsharkawy[1], Mostafa Mohamed Abu Zeid[2], Mohamed El Said Ahmed[3], Samir Mohamed Attia[4]**

Departments of [1]Emergency Medicine, [2] Gastroenterology Surgery, [3] Critical Care Medicine Emergency Hospital and [4]Vascular Surgery - Faculty of Medicine – Mansoura University

***Corresponding author:** Nagat Moaz Hamza Youssef Elsharkawy, **Mobile:** (+20) 01010899747,

**Email** noogayoussef@yahoo.com

## ABSTRACT

**Background:** Acute mesenteric ischemia (AMI) is an emergency condition, which is accompanied by fatal complications. Clinical signs and symptoms are often unspecific. In addition, there is no single laboratory test to diagnose acute mesenteric ischemia. Early and accurate diagnosis of intestinal ischemia is important to provide rapid and correct treatment and reduce morbidity and mortality rates.

**Objective:** To determine the clinical predictors of outcome in patients with acute mesenteric ischemia at Emergency Hospital, Mansoura University. **Materials and Methods:** This was a prospective study, which was conducted on patients that were admitted to Emergency Hospital, Mansoura University over a year from December 2019 to December 2020. All patients above 18 years old with acute mesenteric ischemia were included while whom less than 18 years old were excluded. **Results:** this study had 50 patients (21 males and 29 females) with average age of 66 years old. The results showed that majority of the studied cases died, while only 42% (21 cases) of AMI cases survived. Hypercholesterolemia was considered the most frequently reported Co-morbidity followed by HTN, AF and lastly DM and cardiomegaly. There were statistically significant differences as regards co-morbidities (presence of 2 or more co-morbidities). **Conclusion:** Acute Mesenteric Ischemia is a serious condition with high mortality rate especially in advanced age and in cases associated with comorbidities, presence of 2 or more co-morbidities, hypertension, hypercholesterolemia, past surgical history increase the incidence of death.

**Keywords**: Acute Mesenteric Ischemia, Hypercholesterolemia, Transmural necrosis, Peritonitis.

## INTRODUCTION

Intestinal ischemia refers to insufficient blood flow within the mesenteric circulation to meet the metabolic demands in the bowel [(1)]. Acute mesenteric ischemia (AMI) remains a dreaded surgical emergency that continues to be fraught with elevated morbidity and mortality rates [(2)]. It is a potentially catastrophic entity leading to ischemia, cellular damage, intestinal necrosis and eventually patient death if untreated and may require emergent intervention [(3)].

The mortality rate in AMI remains high due to challenges in early diagnosis, the lack of specific markers, and irreversible intestinal ischemia secondary to delay in diagnosis. Although significant advances in its diagnosis and treatment have been made over the last decade, mortality rates are still reported to be around 40-70% for acute mesenteric ischemia mainly due to a low index of suspicion [(4)].

The etiologic cause in 70-80% of cases with AMI is intestinal ischemia that occurs as a result of occlusion of the mesenteric artery due to an embolus or thrombus. Embolic occlusion results in earlier ischemia and transmural necrosis as compared with other causes, due to the absence of a well-developed collateral circulation [(5)]. Strangulated hernia, venous thrombosis and non-occlusive causes are rare reasons of AMI [(6)].

Because early diagnosis is critical for improving morbidity and mortality, the emergency medicine provider must maintain a high level of clinical suspicion, particularly in high-risk patient populations [(7)].

Incidence increases from the sixth to eighth decade of life, with a slight prevalence in males. The risk of developing bowel infarction is significantly higher in patients with a history of atrial fibrillation and/or myocardial infarction, in smokers, and in patients suffering from hypertension. Abdominal aortic aneurysm is another important risk factor [(8)].

The general factors that are affecting the prognosis include older age, those with delayed presentation, peritonitis at presentation, those who present with organ failure, extent of necrosis, and recent major cardiovascular surgery [(9)].

The basis of treatment in cases of acute mesenteric ischemia is composed of early diagnosis, resection of the intestinal sections with infarction, regulation of intestinal blood flow, second look laparotomy when required and intensive care support [(10)]. The aim of this study was to determine the clinical predictors of outcome in patients with acute mesenteric ischemia at Emergency Hospital Mansoura University.

## PATIENTS AND METHODS

This was a prospective study conducted on patients who were admitted to Emergency Hospital Mansoura University over a year from December 2019 to December 2020.

**Inclusion criteria:** All patients above 18 years old with acute mesenteric ischemia

**Exclusion criteria:** Age < 18 years old and pregnant women.





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**All cases were subjected to:**

**1. Resuscitation**:

a. **Airway** opening and maintenance.
b. **Breathing** and mechanical ventilation.
c. **Circulation**: in cases with hypotension (IV saline and crystalloids and vasopressors).
d. **Disability**: Glasgow **coma scale (GCS): in cases with coma give coma cocktail** (Thiamine 100 mg + Naloxone + Dextrose 10%).
e. **Exposure:** Segmental expose to detect any trauma.

**2. Specific treatment measure in AMI:**

- **Patient** with AMI have profound metabolic disturbance that should be corrected, IV fluid resuscitation with crystalloids and blood products should be started to correct the volume deficit and acidosis.
- **Prophylactic** broad-spectrum antibiotic should be started.

**3. Complete History taking:**

- Taken from patient himself or from relative with altered mental status.
- The chief complains.
- Present history: The most important finding is pain that is disproportionate to physical examination findings. Typically, pain is moderate to severe, diffuse, non-localized, constant, and sometimes colicky. Onset varies from type to type. Nausea, vomiting, anorexia and diarrhea, abdominal distention and gastrointestinal (GI) bleeding. Pain may be unresponsive to opioid. Rectal bleeding and signs of sepsis.
- Past medical history:
- Acute mesenteric arterial embolism: History of atrial fibrillation or myocardial infarction (MI) with mural thrombus.
- Acute mesenteric arterial thrombosis: patients typically have a history of atherosclerotic disease, such as coronary artery disease (CAD), cerebrovascular disease, recent MI, peripheral artery disease (PAD) and congestive heart failure (CHF)
- Non-occlusive mesenteric ischemia: Elderly patients are already in an intensive care unit (ICU) with acute respiratory failure or severe hypotension from cardiogenic or septic shock.
- Mesenteric venous thrombosis: Many patients have deep vein thrombosis (DVT), pulmonary embolism (PE), liver disease, cancer.

**4. Full clinical Examination:**

- **General examination:**

**Vital** signs (blood pressure, pulse, RR, temperature and $O_2$ saturation), fever, hypotension, tachycardia, tachypnea, and altered mental status were observed. Foul breath may be noted with bowel infarction, from the putrefaction of undigested alimentary material accumulated proximal to the pathologic site. Paracentesis may demonstrate bloody peritoneal fluid; however, this occurs after bowel infarction and therefore is a late sign.

- **Local examination:**

Inspection consists of visual examination of the abdomen with note made for the shape of the abdomen, skin abnormalities, abdominal masses, and the movement of the abdominal wall with respiration. Abnormalities detected on inspection provide clues to intra-abdominal pathology.

Auscultation of the abdomen is performed for detection of altered bowel sounds, rubs, or vascular bruits. Normal peristalsis creates bowel sounds that may be altered or absent by disease. Irritation of serosal surfaces may produce a sound (rub) as an organ moves against the serosal surface. Atherosclerosis may alter arterial blood flow so that a bruit is produced.

Palpation and auscultation of the abdomen for crepitus of the abdominal wall, for any abdominal tenderness, or for abdominal masses.

Digital rectal examination: Stool may be positive for blood.

**5. Investigation:**

- Laboratory tests: Complete blood count (CBC), ABO grouping, Serum creatinine (Sr Cr) and arterial blood gases (ABG).
- Radiological investigations: X-ray, ultrasound, Doppler and CT angiography.
- Electrocardiography (ECG).

**Ethical approval:**

**The study was approved by the Ethics Board of Mamsoura University and an informed written consent was taken from each participant in the study.**

**Statistical analysis**

Data were analyzed using software package for social sciences. The quantitative data were expressed as range, mean ± standard deviation. The qualitative data were expressed as number and percentage. The predictors of validity and predictability were calculated. These tests were considered to be statistically significant when $p \leq 0.05$.

**RESULTS**

As regards, the demographic characteristics of the studied cases, the mean age of the studied cases was 66.84 years. Of them, 21 cases were males and 29 cases were females as shown in table (1). There were 21 survived cases with mean age of 62.29 years compared to 29 died cases with mean age of 70.14 years. Higher mean age was associated with mortality. There was statistically significant difference between survived and dead cases as regards the age as shown in table (2).

**Table (1):** Demographic characteristics distribution among studied cases

| | | n=50 | % |
|---|---|---|---|
| **Age/years** | **Mean ± SD** | 66.84 ± 8.37 | |
| **Sex** | **Female** | 29 | 58.0 |
| | **Male** | 21 | 42.0 |

**Table (2):** Association of demographic characters of the studied cases and incidence of mortality

| | Total number | Survived n=21(42.0%) | Died n=29(58.0%) | test of significance |
|---|---|---|---|---|
| **Age/years** Mean ± SD | 66.84 ± 8.37 | 62.29 ± 7.46 | 70.14 ± 7.48 | T = 3.67 P = 0.001* |
| **Sex** | | | | |
| Male | 21 | 8 (38.1) | 13 (61.9) | $\chi^2$ = 0.227 |
| Female | 29 | 13 (44.8) | 16 (55.2) | p = 0.773 |
| **t: Student t test $\chi^2$: Chi-Square test *statistically significant (if p<0.05)** | | | | |

There were no statistically significant differences between survived and dead as regards median CRP, presence of Hb < 8 gm/dl and presence of PLT < 100000. There was a statistically significant difference between survived and dead cases as regards median serum creatinine, median Leukocytes, presence of LDH < 25 and LDH >250, presence of Pa $O_2$ < 60 and Pa $O_2$ > 60 and presence of metabolic acidosis as shown in table (3).

**Table (3):** Association between laboratory results and incidence of mortality among studied cases

| | Total number | Survived n=21(42.0%) | Died n=29(58.0%) | test of significance |
|---|---|---|---|---|
| **CRP (mg/L) median (min-max) (IQR)** | 12.0(6.0-72.0) (I8.0-24.0) | 12.0(6.0-24.0) (7.0-24.0) | 12.0(8.0-72.0) (8.0-24.0) | z=0.829 p=0.407 |
| **Serum creatinine (mL/min) median (min-max) (IQR)** | 2.0(1.0-3.2) (1.48-2.0) | 1.5(1.0-2.8) (1.2-2.0) | 2.0(1.3-3.2) (1.8-2.2) | z=2.97 p=0.003* |
| **Leukocytes (mcL) median (min-max) (IQR)** | 17.9(4.5-25.0) (13.0-20.25) | 13.0(4.5-21.0) (13.0-14.5) | 19.0(14.5-25.0) (17.4-22.0) | Z=4.63 P=0.001* |
| **LDH (IU/I)** | | | | |
| **<250** | 27 | 15(55.6) | 12(44.4) | $\chi^2$=4.43 |
| **>250** | 23 | 6(26.1) | 17(73.9) | P=0.035* |
| **Hb (gm/dl)** | | | | |
| **<8** | 21 | 9(42.9) | 12(57.1) | $\chi^2$=0.011 |
| **>8** | 29 | 12(41.4) | 17(58.6) | P=0.917 |
| **PLT (mcL)** | | | | |
| **<100 000** | 9 | 3(33.3) | 6(66.7) | $\chi^2$=0.338 |
| **>100 000** | 41 | 18(43.9) | 23(56.1) | P=0.561 |
| **Hypoxia** | | | | |
| **Pa O2 > 60** | 15 | 11(73.3) | 4(26.7) | $\chi^2$=8.64 |
| **Pa O2 < 60** | 35 | 10(28.6) | 25(71.4) | P=0.003* |
| **Metabolic acidosis (mol/L)** | | | | |
| **-ve** | 23 | 14(60.9) | 9(39.1) | $\chi^2$=6.23 |
| **+ve** | 27 | 7(25.9) | 20(74.1) | P=0.013* |
| **$\chi$2: Chi-Square test. *statistically significant (if p<0.05). PLT: Platelets. Z: Mann Whitney U test. Hb: hemoglobin. LDH: Lactate dehydrogenase.** | | | | |

There was statistically significant difference between survived and dead cases as regards time from ICU admission to diagnosis ≤ 24 h and time from ICU admission to diagnosis >24. There was statistically significant difference between survived and dead cases as regards reasons for ICU admission, which was either surgical or urgent admission as shown in table (4).

**Table (4):** Association between time of admission and reasons of ICU admission and incidence of mortality among studied cases

| | Total number | Survived n=21(42.0%) | Died n=29(58.0%) | test of significance |
|---|---|---|---|---|
| **Time from ICU admission to diagnosis (days)** | | | | |
| **≤24 h** | 17 | 11(64.7) | 6(35.3) | $\chi^2$=5.45 |
| **>24 h** | 33 | 10(30.3) | 23(69.7) | **P=0.02*** |
| **Reasons for ICU admission** | | | | |
| **Surgical** | 10 | 10(100.0) | 0(0.0) | $\chi^2$=17.26 |
| **Urgent** | 40 | 11(27.5) | 29(72.5) | **P=0.001*** |

There was statistically significant difference between survived and dead cases as regards the presence of tachycardia >120 and tachycardia < 120 beats/min., presence of SBP > 90 and SBP < 90 mmHg and presence of tachypnea < 26 /minute and Tachypnea > 26 /minute as shown in table (5).

**Table (5):** Association between clinical findings and incidence of mortality among studied cases

| | Total number | Survived n=21(42.0%) | Died n=29(58.0%) | test of significance |
|---|---|---|---|---|
| **Tachycardia** | | | | |
| >120 (b/min) | 23 | 16(69.6) | 7(30.4) | $\chi^2$=13.28 |
| <120 (b/min) | 27 | 5(18.5) | 22(81.5) | p=0.001* |
| **Hypotension** (mm/hg) | | | | |
| SBP>90 | 20 | 13(65.0) | 7(35.0) | $\chi^2$=7.24 |
| SBP<90 | 30 | 8(26.7)) | 22(73.3) | p=0.007* |
| **Tachypnea** | | | | |
| <26 /minute | 16 | 11(68.8) | 5(31.2) | $\chi^2$=6.91 |
| >26 /minute | 34 | 10(29.4) | 24(70.6) | p=0.009* |

There were statistically significant differences between survived and dead cases as regards the presence of vessel obstruction and presence of Hypo-enhancement of bowel wall. Nevertheless, there were no statistically significant differences between survived and dead cases as regards the presence of thickened bowel wall, dilated bowel and air in mesenteric vessel (Table 6).

**Table (6):** Association between CT findings and incidence of mortality among studied cases

| CT findings | Total number | Survived n=21(42.0%) | Died n=29(58.0%) | test of significance |
|---|---|---|---|---|
| **Vessel obstruction** | 35 | 8(22.9) | 27(77.1) | $\chi^2$=17.55 p=0.001* |
| **Hypo-enhancement of bowel wall** | 22 | 4(18.2) | 18(81.8) | $\chi^2$=9.15 p=0.002* |
| **Thickened bowel wall** | 28 | 13(46.4) | 15(53.6) | $\chi^2$=0.512 p=0.474 |
| **Dilated bowel** | 30 | 15(50.0) | 15(50.0) | $\chi^2$=1.97 p=0.160 |
| **Air in mesenteric vessel** | 36 | 16(44.4) | 20(55.6) | $\chi^2$=0.315 p=0.574 |

Univariate of mortality predictors among studied cases were evaluated, in which the **significant** predictors of death were age, co-morbidities, presence of 2 or more co-morbidities, hypertension, hypercholesterolemia, past surgical history (positive), serum creatinine, LDH, leukocytes, hypoxia, metabolic acidosis, time from ICU admission to diagnosis, reasons for ICU admission, tachycardia, hypotension, tachypnea, vessel obstruction and hypo-enhancement of bowel wall. Whereas, **insignificant** predictors of death were sex, hypercoagulability state, DM, cardiomegaly, AF, CRP, Hb, PLT, thickened bowel wall, dilated bowel and air in mesenteric vessel as shown in table (7).

**Table (7):** Univariate of mortality predictors among studied cases

| | Univariate analysis | |
|---|---|---|
| | p | COR |
| **Age/years (Mean ± SD)** | 0.003* | 1.14 (1.05-1.25) |
| **Sex**<br>**Male**<br>**Female(r)** | 0.634 | 1.132<br>(0.42-4.15) |
| **Co-morbidities**<br>**Absent(r)**<br>**present** | 0.004* | 6.96 (1.85-26.09) |
| **Presence of 2 or more co-morbidities**<br>**-ve (r)**<br>**+ve** | 0.001* | 32.73<br>(3.83-279.24) |
| **Hypertension** | 0.02* | 6.71 (1.31-34.35) |
| **Hypercoagulability state** | 0.99 | undefined |
| **Hypercholesterolemia** | 0.013* | 5.23 (1.41-19.42) |
| **DM** | 0.99 | undefined |
| **Cardiomegaly** | 0.141 | 5.22(0.578-47.09) |
| **AF** | 0.395 | 1.91(0.431-8.46) |
| **Past Surgical history (positive)** | 0.029* | 4.88(1.17-20.26) |
| **CRP (mg/L)** | 0.441 | 1.02(0.965-1.08) |
| **Serum creatinine (mg/dL)** | 0.007* | 7.93(1.78-35.27) |
| **LDH (IU/I)**<br>**<250 (r)**<br>**>250** | 0.039* | 3.54(1.07-11.77) |
| **Leukocytes** | <0.001* | 1.60 (1.25-2.06) |
| **Hb (gm/dl)**<br>**<8**<br>**>8** | 0.917 | 1.06(0.341-3.31) |
| **PLT (U/L)**<br>**<100 000 (r)**<br>**>100 000** | 0.563 | 0.639(0.140-2.91) |
| **Hypoxia**<br>**Pa O2 >60 (r)**<br>**Pa O2<60** | 0.005* | 6.88(1.77-26.77) |
| **Metabolic acidosis**<br>**-ve (r)**<br>**+ve** | 0.015* | 4.44(1.34-14.77) |
| **Time from ICU admission to diagnosis (days)**<br>**≤24 h (r)**<br>**>24 h** | 0.023* | 4.22(1.22-14.58) |
| **Reasons for ICU admission**<br>**Surgical (r)**<br>**Urgent** | <0.001* | undefined |
| **Tachycardia**<br>**>120 (b/min) (r)**<br>**<120 (b/min)** | 0.001* | 10.05(2.69-37.49) |
| **Hypotension (mm/hg)**<br>**SBP>90 (r)**<br>**SBP<90** | 0.009* | 5.11(1.50-17.37) |
| **Tachypnea**<br>**<26 /minute (r)**<br>**>26 /minute** | 0.01* | 5.28(1.46-19.16) |
| **Vessel obstruction** | <0.001* | 21.94(4.07-118.2) |
| **Hypo-enhancement of bowel wall** | 0.004* | 6.96(1.85-26.09) |
| **Thickened bowel wall** | 0.475 | 0.659(0.210-2.068) |
| **Dilated bowel** | 0.164 | 0.429(0.130-1.415) |
| **Air in mesenteric vessel** | 0.575 | 0.694(0.194-2.48) |

Multivariate analysis of mortality predictors among studied cases was evaluated in which, the age, leukocytes, hypoxia, vessel obstruction and hypo-enhancement of bowel wall were the only significant predictors of mortality as shown in table (8).

**Table (8):** Multivariate analysis of mortality predictors among studied cases

| | **Multivariate analysis** | |
|---|---|---|
| | P | AOR |
| **Age/years**<br>**Mean ± SD** | 0.024* | 1.61(1.06-2.42) |
| **Leukocytes** | 0.04* | 3.34(1.04-10.75) |
| **Hypoxia**<br>**Pa O2 >60 (r)**<br>**Pa O2<60** | 0.04* | 5.22(1.01-24.63) |
| **Vessel obstruction** | 0.034* | 18.57(1.2-100.7) |
| **Hypo-enhancement of bowel wall** | 0.02* | 6.22(1.45-20.41) |
| **Overall % predicted =90.0%** | | |

## DISCUSSION

Acute mesenteric ischemia (AMI), one of the causes of acute abdominal pain due to occlusion of the superior mesenteric artery, has a fatal course as a result of intestinal necrosis. There is no specific laboratory test to diagnose acute mesenteric ischemia. Early and accurate diagnosis of intestinal ischemia is important in order to provide rapid and correct treatment and reduce morbidity and mortality rates. Clinical signs and symptoms are often unspecific [10, 11].

As regards, the demographic characteristics of the studied cases, the mean age of the studied cases was 66.84 years, of them, 21 cases were males and 29 cases were females (male to female (M/F) ratio was 42/58). As regards, the association between the demographic characters of the studied cases and incidence of mortality, the survived cases demonstrated highly significant reduction in age in comparison with died cases ($P < 0.001$), while there was no statistically significant difference in terms of sex ($P > 0.05$). This is Similar to **Dhamnaskar *et al.*** [12] who revealed that, higher age group (more than 60) displayed higher incidence of mortality and such incidence reached statistically significant ($P < 0.05$), while there was no statistically significant difference as regards sex where male and female cases displayed comparable rate of mortality. In the same line, **Aliosmanoglu *et al.*** [13] conducted their study on 56 men (58.9%) and 39 women (41.1%), with mean age of 68.4 ± 14.4 years. There were highly statistically significant difference among living and dead cases as regards age (higher mortality rates among old age groups compared to younger age) ($P = 0.001$), while there were no significant differences as regards sex ($P > 0.05$).

The current study revealed that, mortality rate was 58% (29 cases) with only 42% (21 cases) of AMI cases were survived. It was reported that, arterial embolus or thrombus in the superior mesenteric artery is the cause of intestinal ischemia in 70–80% of cases. Less frequently, ischemia is due to a venous thrombus or non-thrombotic mechanical causes [10, 14]**.** The actual mechanism of AMI induced death is not completely understood. However, two main precipitating factors were thought to be interfered with, sepsis and multi organ failures as reported by **Benjamin and Oropello** [15] and **Cerqueira *et al.*** [16]**.**

The two main causes of acute superior mesenteric artery thrombosis are atherosclerotic occlusion and embolic occlusion. In one autopsy series, the embolus/thrombus ratio was 1.4 to 1. Other rare causes, including vasculitis and aortic dissection that may be predisposing factors [17]**.** In the same line, **Yıldırım *et al.*** [10] reported in their study that twenty-seven patients died (58.7%) while 19 survived (41.3%). Furthermore, **Acosta** [18] demonstrated that the prevalence of mortality among AMI cases was ranging from 50 to 70 %.

As regards, the association between laboratory results and incidence of mortality among studied cases, the current study demonstrated that, living cases demonstrated lower values as regards serum creatinine, leukocytes, LDH, hypoxia and metabolic acidosis in comparison with died cases with statistically significant differences ($P < 0.05$). In the same line, **Dhamnaskar *et al.*** [12] reported that, there was statistically significant difference among living and dead cases as regards hypoxia, while there was no statistically significant difference as regards Hb, which comes in accordance with the current study. On the other hand, they were in disagreement with the current study as they recorded that there were no statistically significant differences as regards serum creatinine, leukocytes and metabolic acidosis. On the contrary, **Yıldırım *et al.*** [10] revealed that, there were no statistically significant differences among living and died cases as regards all laboratory parameters (ALT, AST, bilirubin, calcium, leucocytes, RDW, CK, LDH and lipid profile parameters) ($P > 0.05$), while they are in agreement with the current study as regards of Hb and platelets.

The current study displayed that co-morbidities existed in 44% of cases. In addition, only 19 cases had 2 or more co-morbidities. Hypertension was reported in 14 cases, hypercoagulability state in 8 cases, hypercholesterolemia (the most frequently reported Co-morbidity) in 20 cases, DM in seven cases, cardiomegaly in 7 cases, AF in 10 cases while past surgical history was reported in 16 cases. In the same line, **Aliosmanoglu *et al.*** [13] demonstrated that 42.1% of the studied cases had associated co morbidities.

As regards, association of co-morbidities and incidence of mortality among the studied cases, there were statistically significant differences as regards co-morbidities, presence of 2 or more co-morbidities, past surgical history, hypertension, hypercoagulability state, hypercholesterolemia, diabetes mellitus (DM), while there were no significant differences as regards cardiomegaly and AF among survived and died individuals. Similarly, **Dhamnaskar *et al.*** [12] demonstrated that, there were highly statistically significant correlations between the incidences of mortality and both co-morbidities, presence of 2 or more co-morbidities ($P < 0.05$). On contrary, **Yıldırım *et al.*** [10] demonstrated that, associated co-morbidities (such as COPD, HTN, DM, atrial fibrillation) seemed to have no correlation with mortality in AMI cases as AMI cases with associated co-morbidities demonstrated no significant mortality rates compared to comorbidity free cases ($P > 0.05$).

As regards the association between clinical findings and incidence of mortality among studied cases, the survived cases demonstrated highly significant elevation in heart rate, reduction in SBP and respiratory rate in comparison with the dead cases ($P < 0.001$). This comes in accordance with, **Dhamnaskar *et al.*** [12] who demonstrated that, there were highly statistically significant correlations between all clinical parameters (peritonitis, hypotension, tachypnea and refractory hypotension) ($P < 0.05$) and mortality except tachycardia which demonstrated insignificant correlation ($P > 0.05$).

As regards predictor of mortality among the studied cases, univariate analysis demonstrated that, age ($P = 0.003$), co-morbidities ($P = 0.004$), presence of 2 or more co-morbidities ($P = 0.001$), hypertension ($P = 0.02$), hypercholesterolemia ($P = 0.013$), past surgical history (positive) ($P = 0.029$), serum creatinine ($P = 0.007$), LDH ($P = 0.001$) and leukocytes ($P = 0.001$). In addition, hypoxia ($P = 0.005$), metabolic acidosis ($P = 0.015$), time from ICU admission to diagnosis ($P = 0.023$), reasons for ICU admission ($P = 0.001$), tachycardia ($P = 0.001$), hypotension ($P = 0.009$), tachypnea ($P = 0.01$), vessel obstruction and hypo-enhancement of bowel wall ($P=0.004$) all were considered a significant predictors for mortality. Whereas, sex ($P = 0.634$), hypercoagulability state ($P = 0.99$), DM ($P = 0.99$), cardiomegaly ($P = 0.141$), AF ($P = 0.395$), CRP ($P = 0.441$), Hb ($P = 0.917$), PLT ($P = 0.563$), thickened bowel wall ($P = 0.475$), dilated bowel ($P = 0.164$) and air in mesenteric vessel ($P = 0.579$) were considered as insignificant predictors.

Regarding multivariate analysis of mortality predictors in the present study, the age ($P = 0.024$), leukocytes ($P = 04$), hypoxia ($P = 04$), vessel obstruction ($P = 0.034$) and hypo-enhancement of bowel wall ($P = 0.02$) were the only significant predictors of mortality.

In accordance, **Dhamnaskar *et al.*** [12] revealed that, advanced age, presence of co-morbid conditions, delayed (> 24 hours) presentation, hypotension, tachypnea, hypoxia, more than two system failures, more than three feet length of resected gangrenous bowel, < 100 cm of remnant viable bowel and more than one mesenteric arterial involvement are negative predictors of mortality. Whereas, laboratory parameters like hemoglobin, leucocyte count, serum creatinine and metabolic acidosis have no statistically significant correlation to mortality. Similarly, presence of perforation of gangrenous intestine, ileocecal resection, amount of contamination has no effect on morality rate. In the same line, **Kougias *et al.*** [19] demonstrated in their univariate analysis that, renal insufficiency ($P < 0.02$), age > 70 ($P < 0.001$), metabolic acidosis ($P < .02$), symptom duration ($P < .005$) and bowel resection in second-look operations ($P < .01$) were associated with mortality. Logistic regression analysis showed that age > 70 ($P = .03$) and prolonged symptom duration ($P = .02$) were independent predictors of mortality.

Also, **Paladino *et al.*** [20] demonstrated that, the extent of necrosis and diagnostic delay seemed to be the most important prognostic factors even after adjusting for confounding due to age, presence of comorbidities, and laboratory tests (LDH and WBC).

## CONCLUSION

The current study concluded that, AMI is a serious condition with high mortality rate especially in advanced age and in cases associated with comorbidities. In addition, presence of 2 or more co-morbidities, hypertension, hypercholesterolemia, past surgical history, serum creatinine, LDH, leukocytes, hypoxia, metabolic acidosis, time from ICU admission to diagnosis, reasons for ICU admission, tachycardia, tachypnea, hypotension, vessel obstruction and hypo-enhancement of bowel wall were considered significant mortality predictors.

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