

## Prevalence of Acute Gastro Intestinal Tract Bleeding in Patients Undergoing Primary Percutaneous Coronary Intervention After Acute Myocardial Infarction

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### ABSTRACT

**Objective:** To determine the prevalence of acute gastro-intestinal tract bleeding and the factors associated with it in patients undergoing Primary PCI after acute myocardial infarction.

**Study Design:** Analytical Cross-sectional study.

**Place and Duration of Study:** Department of Interventional Cardiology, Tertiary Cardiac Care Center, Rawalpindi Pakistan, from May 2021 to April 2022.

**Methodology:** Five hundred patients (n =500) between 30-80 years of age, presented at the emergency of Tertiary cardiac care center, Rawalpindi and diagnosed with Acute Myocardial Infarction were planned to undergo the Primary Percutaneous Coronary Intervention (PCI) procedure. After the procedure, patients were evaluated for acute gastro-intestinal tract bleeding within first 48 hrs. Blood samples were taken before and after 24 hrs and 72 hrs of primary PCI. The blood hemoglobin level was assessed and fall in its level was noted. SPSS-26 was used to enter and analyze the collected data.

**Results:** Out of n=500 patients enrolled in the study, 440(88%) were males and 60(12%) were females. The mean age of patients was  $64.27 \pm 6.47$  years. The mean time from symptoms onset to primary PCI was  $9.74 \pm 5.15$  hrs. The mean duration of the procedure was  $34.99 \pm 6.01$  mins. After the procedure, 23(4.60%) patients had developed the acute gastro-intestinal tract bleeding. In patients who developed acute gastro-intestinal bleeding, mean blood hemoglobin level before the procedure was  $11.95 \pm 1.05$  g/dl, which was reduced to  $8.46 \pm 0.51$  g/dl after the procedure. In patients who did not develop it, the mean blood hemoglobin level before the procedure was  $11.94 \pm 1.03$  g/dl, which was reduced to  $11.80 \pm 1.04$  g/dl after the procedure. The blood hemoglobin level after the procedure was significantly less in patients who suffered from acute gastro-intestinal tract bleeding.

**Conclusion:** The research study concluded that the frequency of acute gastro-intestinal tract bleeding in patients after primary PCI for acute myocardial infarction was very low but on the other hand marked reduction in blood hemoglobin level was observed, which can lead to many adverse sequelae.

**Keywords:** Acute gastro-intestinal bleeding, Acute myocardial infarction, Hemoglobin level, Primary percutaneous coronary intervention.

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### INTRODUCTION

Percutaneous Coronary Intervention is the most effective and commonly practiced cardiac invasive procedure for treating the patients with coronary artery disease. The introduction of fourth generation drug-eluting stents (DES) and optimal usage of anti-platelet and anti-thrombotic medications, the dreadful complications such as coronary artery dissection, perforation and no-reflow phenomenon in the previous plain balloon angioplasty (POBA) technique time have been significantly lessened. According to recent statistics from the USA, bleeding occurs around 1.7% after

PCI, with half occurring at the arterial access site (femoral/radial) and the other half occurring at non-access sites i.e from gastrointestinal tract.<sup>1</sup>

Post-PCI the management of patients who had bleeding episodes from other body sites is not easy and is often challenging to the Interventional Cardiologists' and Coronary care unit team, because it carefully requires balancing the merits and demerits of discontinuing the anti-platelet or anti-coagulation therapy, as well as the transfusion of red blood cells (RBCs) concentrate is of more benefit rather than causing harmful effects.<sup>2</sup> The researchers have formed the bleeding risk scores in order to predict the risk of bleeding after PCI and these are helpful to the patients in understanding

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the risk of bleeding after PCI and practically aid in treatment options.<sup>3,4</sup>

Primary PCI has been shown to be very successful in restoring the patency of coronary arteries after acute myocardial infarction and thus in this way salvaging the ischemic myocardium.<sup>5,6</sup> Acute gastrointestinal tract bleeding after the invasive coronary artery procedures has been extensively studied for its predictive risk factors and clinical impacts and these are well documented in the literature.<sup>7,8</sup> However little data is present for Post-graduate teaching hospitals, tertiary care hospitals and National cardiology Institutes in Pakistan. The main objective is to determine the prevalence of acute gastrointestinal tract bleeding in patients after primary PCI. It helps the Interventional Cardiologists' in implementing the alternative treatment strategies or modifications in already existing management protocols of primary PCI in order to prevent acute gastrointestinal tract bleeding and as well as complications related to it after primary PCI. Our study was aimed to determine the prevalence of acute gastrointestinal tract bleeding in patients after primary PCI for acute myocardial infarction and to assess the factors associated with acute gastro-intestinal tract bleeding in patients after primary PCI for acute myocardial infarction.

### METHODOLOGY

Acute myocardial infarction was considered when 2 of following 3 criteria points present: (1) Typical or atypical chest pain radiating to the arms, neck, back or jaw and persistent for >15 minutes duration, (2) Specific cardiac myocytes injury markers elevation >reference range set by the pathology lab of the Institute and (3) Appearance of new ST-T-wave changes or new Q waves on electrocardiography (ECG).

The study was conducted at Department of Interventional Cardiology, Tertiary Cardiac Care Center, Rawalpindi Pakistan, from May 2021 to April 2022.

**Sample Size:** Taking the confidence level 95% along with 05% margin of error and 10% frequency of acute gastro-intestinal tract bleeding after primary PCI for acute myocardial infarction; the sample size was calculated to be (n=138). In this study the data was collected from 500 patients.

**Inclusion Criteria:** After applying the non probability, consecutive sampling technique, five hundred (n=500) patients of both genders between 30-80 years of age and diagnosed with acute myocardial infarction at emergency department of Tertiary cardiac care center,

Rawalpindi and Primary PCI was decided to be done after getting the informed consents from them.

**Exclusion Criteria:** Patients with gastro-intestinal tract congenital abnormalities, past or recent history of gastro-intestinal tract surgery, gastro-intestinal tract malignancy, lower esophageal disorders, peptic or duodenal ulcer disease, Inflammatory bowel disease, haemorrhoids, past or recent history of chronic liver disease (cirrhosis) or on treatment for acute or chronic liver disease or having liver transplant were excluded from the study. Patients with history of blood cells and bleeding disorders or bone marrow transplant were also excluded.

After seeking the approval of research study from the IERB committee (IERB Itr # 9/7/R&D/2021/108) and the research department, 500 patients presenting in the emergency room, meeting the inclusion criteria were included in the study after describing to them the primary PCI procedure and its complications in detail and getting their informed consents. Blood baseline (CBC, RFTs, LFTs, S/E) values, factors directly or indirectly linked to the procedure and risk factors that are related to acute gastro-intestinal tract bleeding or coronary heart disease were taken from the hospital files and charts. Blood baselines were obtained on admission in the emergency room before shifting the patients to cardiac catheterization lab for primary PCI. Then Primary PCI was performed by the competent and experienced Interventional Cardiologist's team of Tertiary cardiac care center, Rawalpindi according to ACC/AHA guidelines. The type and dose of contrast agent, PCI technique, and supportive pharmacological therapies during primary PCI were left to the decision of the Interventional cardiologist. The procedural accomplishment was defined as successful treatment of one or more critical lesions by placing stents (DES/BMS) with restoring TIMI-III flow in the coronary arteries without in-hospital death, re-infarction of the myocardium, or emergency cardiac bypass surgery. Then blood samples were taken again in order to evaluate the blood haemoglobin (Hb) level at 24 hrs and 72 hrs after the primary PCI procedure. Acute gastrointestinal tract bleeding, also called gastro-intestinal tract hemorrhage includes all forms of bleeding, from the oral cavity to the rectum in the first 48 hours after the primary PCI procedure. When there was significant blood loss over a short span of time, the haemoglobin level in the blood falls and signs and symptoms of post hemorrhagic anemia appears and these are evident to the clinician. "Statistical Package for Social Sciences"

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SPSS v 26 was used to enter and analyze the collected data. Frequency and percentages are calculated for categorical variables like diabetes, hypertension, gender etc. Mean and standard deviation are estimated for continuous variables like age and BMI. Patients who developed acute gastro-intestinal tract bleeding after the procedure were compared to patients without it. Data will be stratified for age, gender, BMI, diabetes, hypertension, history of smoking, h/o heart failure, previous PCI or CABG, Pre-procedure cardiogenic shock, time from symptoms onset to primary PCI and duration of the procedure. Post stratification chi square test and paired t-test was applied keeping  $p$ -value  $<0.05$  as significant.

### RESULTS

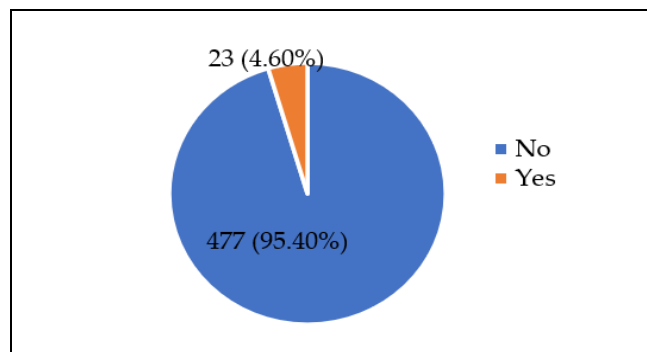
In this research study, the mean age of the patients was  $64.27 \pm 6.47$  years. Out of ( $n=500$ ) cases, 440 (88.0%) were males while 60 (12.0%) were females. The mean BMI of the patients was  $31.09 \pm 5.09$  kg/m<sup>2</sup>. Out of 500 patients, diabetes was present in 288 (57.6%) cases, hypertension in 272 (54.4%) cases; history of smoking was present in 132 (26.4%) cases. The history of heart failure was positive in 15 (3%) cases, 44 (8.8%) patients had previous history of PCI or CABG surgery, while history of pre-procedure cardiogenic shock was positive in 5 (1.0%) cases. The mean time from the symptom onset to primary PCI was  $9.74 \pm 5.15$  hours. The mean duration of primary PCI procedure was  $34.99 \pm 6.01$  min. Table-1.

**Table-I: Characteristics of patients**

Characteristics (n=500)		Mean±SD n (%)
Age (Years)		64.27±6.47
Gender	Male	440(88.0%)
	Female	60(12.0%)
BMI (kg m <sup>2</sup> )		31.09±5.09
Diabetes		288(57.6%)
Hypertension		272(54.4%)
Smoking		132(26.4%)
History of heart failure		15(3.0%)
Previous PCI/CABG		44(8.8%)
Pre-procedure cardiogenic shock		5(01%)
Time from symptoms onset to Primary PCI(min)		9.74±5.15
Duration of the Primary PCI procedure (min)		34.99±6.01

Out of 500 patients who underwent primary PCI after acute myocardial infarction, 23 (4.60%) patients had developed acute gastro-intestinal tract bleeding

after the procedure in the first 48 hrs as shown in Figure.



**Figure: Acute Gastro-Intestinal Tract Bleeding**

In patients who suffered from acute gastrointestinal tract bleeding, different factors were evaluated. It was observed that the bleeding occurred in 0 (0.0%) patients aged  $<50$  years, in 2 (1.9%) patients aged 51-60 years, in 7 (2.2%) patients aged 61-70 years and in 14 (20.0%) patients aged  $>70$  years ( $p < 0.05$ ). In males, bleeding was noted in 19 (4.3%) cases while it is noted in 4 (6.7%) females ( $p > 0.05$ ). In patients with normal BMI it was noted in 3 (3.0%) cases where as in overweight and obese-I patients, it was noted as 13 (3.82%) and 7 (11.7%) respectively. In diabetes, bleeding was noted in 17 (5.9%) while it was 6 (2.8%) in non-diabetics.

In hypertensive patients it was 15 (5.5%) while it was 08 (3.5%) in non-hypertensive cases. In smokers bleeding was noted in 18 (13.6%) in comparison to 05 (1.4%) in non-smokers ( $p > 0.05$ ). In patients with history of heart failure, bleeding was noted in 03 (20.0%) cases versus 20 (4.12%) in patients without history of heart failure. In patients with previous history of PCI/CABG, bleeding was noted in 14 (31.8%) as compared to 09 (1.97%) patients without any previous history. The patients with pre-procedure cardiogenic shock, bleeding was noted in 0 (0.0%) cases where as it was noted in 23 (4.6%) cases without pre-procedure cardiogenic shock. The difference was insignificant ( $p > 0.05$ ) as depicted in Table II.

In patients who developed gastrointestinal bleeding, mean hemoglobin level before procedure was  $11.95 \pm 1.05$  g/dl, which was reduced to  $8.46 \pm 0.51$  g/dl after procedure and this fall was observed as significant ( $p < 0.01$ ). In patients who did not develop gastrointestinal bleeding, mean hemoglobin level before procedure was  $11.94 \pm 1.03$  g/dl, which was reduced to  $11.80 \pm 1.04$  g/dl after procedure and this

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fall was very less but statistically observed as non-significant ( $p>0.05$ ) as depicted in Table III.

clinical practice, acute GI bleeding has been considered as one of the most dreadful complication of PCI

**Table-II Association of Acute Gastro-Intestinal Tract Bleeding with Independent Variable**

		Acute Gastro-Intestinal tract bleeding (n=500) n (%)		p-value
		Yes	No	
Age	<50 years	0 (0.0%)	10 (100%)	<0.01
	51-60 years	2 (1.9%)	103 (98.1%)	
	61-70 years	7 (2.2%)	308 (97.8%)	
	> 70 years	14 (20.0%)	56 (80.0)	
Gender	Male	19 (4.3%)	421 (95.7%)	0.415
	Female	4 (6.7%)	56 (93.3%)	
BMI	Normal	3 (3.0%)	97 (97.0%)	0.406
	Overweight	13 (3.82%)	327 (96.14%)	
	Obese-I	7 (11.7%)	53 (88.3%)	
	Obese-II/III	00 (0.0%)	0 (0.0%)	
Diabetes	Yes	17 (5.9%)	271 (94.1%)	0.007
	No	06 (2.8%)	206 (97.2%)	
Hypertension	Yes	15 (5.5%)	257 (94.5%)	0.282
	No	08 (3.5%)	220 (96.5%)	
Smoking	Yes	18 (13.6%)	114 (86.4%)	0.350
	No	05 (1.4%)	363(98.6%)	
History of Heart failure	Yes	03 (20.0%)	12 (80.0%)	0.003
	No	20 (4.12%)	465 (95.8%)	
Previous PCI / CABG	Yes	14 (31.8%)	30 (68.9%)	0.720
	No	09 (1.97%)	447 (98.02%)	
Pre-procedure Cardiogenic shock	Yes	0 (0.0%)	05 (100%)	0.850
	No	23 (4.6%)	472 (95.4%)	

**Table-III: Blood Hemoglobin Level in Patients with or Without Acute Gastro-Intestinal Tract Bleeding**

Hemoglobin level (mg/dl)	Group	
	Acute Gastro-Intestinal tract bleeding	No Bleeding
Before Procedure	11.95±1.05	11.94±1.03
After Procedure	8.46±0.51	11.80±1.04
<b>p-value</b>	<0.01	0.939

(\*=Paired sample t-test)

### DISCUSSION

Percutaneous coronary intervention (PCI) has brought a revolutionary change in the management of patients with ischemic heart disease (IHD) and as its indications have widened, at the same time the problems have been developed in patients who experience acute gastro-intestinal (GI) tract bleeding while they are getting the dual anti-platelet therapy. The best treatment of a patient with acute GI tract bleeding after the PCI procedure is uncertain because little evidence in particular to its management is available to the Interventional cardiologists. In patients with coronary artery disease and reduce left ventricle ejection fraction, the acute GI tract bleeding carries a worse prognosis.<sup>9</sup> On the other hand, the antiplatelet therapy is very important because it helps in preventing the early stent thrombosis, an emergency life threatening condition that carries a mortality of up to 84%.<sup>10</sup> In today's

procedure. After PCI, it is reported to occur in 3.2-9.1 percent of patients.<sup>10-11</sup>

According to the ACC/AHA guidelines, the main stay management therapy for the majority of ACS (acute coronary syndrome) patients and those undergoing PCI procedures is dual anti-platelet therapy (aspirin and clopidogrel). In recent times, the more effective newer anti-platelet drugs such as prasugrel, ticagrelor and cangrelor have manifested additional benefits in comparison with the older anti-platelets in the management of ACS patients. However, these potent drugs are linked with a higher incidence of GI tract bleeding.<sup>10</sup> The ACC/AHA guidelines currently recommended twelve months of treatment therapy with DAPT for acute coronary syndrome patients and in patients having 4th generation drug-eluting stents (DES) in their coronary arteries.<sup>11,12</sup>

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The Interventional cardiologists have developed the bleeding risk scores, which can be used in order to predict the risk of gastro-intestinal tract bleeding after the primary PCI procedure, and these bleeding risk scores can be used at the beside to facilitate the discussion with the patients and potentially assist them in treatment decisions.<sup>12,13</sup>

In this research study, out of 500 cases of primary PCI after the acute myocardial infarction, 23(4.60%) patients were suffered from acute gastro-intestinal tract bleeding after the PCI procedure. In patients who suffered from acute gastro-intestinal tract bleeding, mean blood hemoglobin level before PCI procedure was  $11.95 \pm 1.05$  g/dl, which was reduced to  $8.46 \pm 0.51$  g/dl after the PCI procedure. In patients who did not develop acute gastro-intestinal tract bleeding, mean blood hemoglobin level before the procedure was  $11.94 \pm 1.03$  g/dl, which was reduced to  $11.80 \pm 1.04$  g/dl after the PCI procedure. The blood hemoglobin level was significantly less in patients who suffered from acute gastro-intestinal bleeding after the primary PCI procedure.

In another study, post-PCI acute GI tract bleeding was seen in 2.3% cases, and these patients had a mortality rate of 12%.<sup>14</sup> Recent studies on patients experiencing acute gastro-intestinal tract bleeding reported a mortality of 5.4%.<sup>15,16</sup> Aziz conducted a study in 2014 and concluded that patients with acute GI bleeding after primary PCI had a significantly higher previous history of gastro-intestinal tract bleeding (16.66% vs 8.6%,  $p < 0.001$ ). Moreover higher Killip classification at presentation was associated with higher incidence of gastro-intestinal tract bleeding (61% vs 18%,  $p < 0.01$ ).<sup>17</sup> Albeiruti conducted another study on 5673 patients who underwent primary PCI. Of these patients, 67 (1.2%) patients developed gastro-intestinal tract bleeding within 30 days after PCI procedure.<sup>18</sup>

Following the initial therapy in the emergency room, are a variety of clinical decisions, all of which must be made while carefully evaluating the risks of ischemic episodes and future gastrointestinal tract bleeding events. The usefulness of antiplatelet therapy in the secondary prevention of cardiac events, especially sudden myocardial infarction and early stent thrombosis, must be carefully balanced against the risk of severe acute gastrointestinal tract bleeding.<sup>19,20,21</sup>

### LIMITATIONS OF STUDY

As the study was single centered so, the results cannot be generalized. Multicenter study is recommended in future.

### CONCLUSION

The research study concluded that the frequency of acute gastro-intestinal tract bleeding in patients after primary PCI for acute myocardial infarction, was very low but on the other hand marked reduction in blood hemoglobin level was observed, which can lead to many adverse sequelae. Hence, in future, the management strategy for patients diagnosed with acute myocardial infarction will be modified according to the clinical requirements in order to prevent the acute gastro-intestinal tract bleeding.

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**Conflict of Interest:** None.

### Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

- MNT: Manuscript writing, concept and editing
- NAS: Intellectual contribution, concept and final approval
- MHR: Study design, conception and critical review
- GC: Data management, data collection & manuscript writing
- HMS: Data collection, entry and review of article
- SKS: Intellectual contribution, concept and final approval
- AN: Drafting the manuscript, proof reading & critical review
- AN: Review of article, formatting and critical review
- SNYB: Data collection, entry and review of article
- ZA: Proof reading, Intellectual contribution, data collection

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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