

# Percutaneous Coronary Interventions in Elderly Patients: Experience from a Tertiary Care Center from Developing Country

Sumera Nasim<sup>1\*</sup>, Naresh Kumar<sup>2</sup>, Aysha Zahidie<sup>3</sup>, Ishaq Mohammed<sup>4</sup>, Khalil Rehman<sup>5</sup>

<sup>1</sup>Assistant Professor, Karachi Institute of Heart Disease, Pakistan

<sup>2</sup>Senior Register, Hamdard university, Karachi

<sup>3</sup>Research consultant Aga khan university

<sup>4</sup>Professor of Karachi Institute of Heart Disease

<sup>5</sup>Senior Register of Sir Syed university Karachi

## \*Corresponding author

Sumera Nasim, Assistant Professor, Karachi Institute of Heart Disease, Pakistan.

Submitted: 09 Nov 2021; Accepted: 15 Nov 2021; Published: 20 Nov 2021

**Citation:** Sumera Nasim, Naresh Kumar, Aysha Zahidie, Ishaq Mohammed, Khalil Rehman (2021) Percutaneous Coronary Interventions in Elderly Patients: Experience from a Tertiary Care Center from Developing Country. *Cardio Open*, 6(3): 161-165.

## Abstract

**Objective of the study:** To assess the outcome of Percutaneous coronary intervention in elderly in terms of success and complications.

**Methods:** Retrospective data review of 887 consecutive cases of percutaneous interventions done at Karachi institute of heart diseases from 2015-2020. We divided the patients in three age groups younger (<65 years, n=592); older (65 to 75 years, n=201); and elderly (>=75 years, n=94). Immediate and six months outcomes of in hospital vascular complications, death, myocardial infarction, repeat target lesion revascularization and stroke were compared between these groups.

**Result:** The vascular complications was in three groups (relative risk 3.2% vs 2.9% vs 4.3% with p=0.56) respectively. The relative risk of periprocedural Myocardial infarction in elderly/older patients was not higher than young patients with (OR of 0.6 with 95% CI 0.3 vs 1.4 with P=0.35), so was the need of repeat target revascularization with (OR of 0.3 95% CI 0.2 vs -1.6 with P=0.85), the risk of stroke following procedure was minimal (OR of 0.7 95% CI 0.4 vs 1.6 P=0.4). The in-hospital mortality was higher in elderly with (OR with 95% CI 1.0 vs 2.0 vs 3.4 P=0.03) in three groups. The six months outcomes of myocardial infarction in elderly were also not higher than younger pts (OR 0.7 vs 0.4 P=0.58). so was the need for repeat target revascularization (OR 0.5 vs 0.3 P=0.6). The six-month mortality in three groups was high in elderly (OR with 95% CI 1.5% vs 3.4% vs 4% with P value of 0.04).

**Conclusion:** The procedure success in elderly patients was similar to younger patients, but in hospital and six months mortality was higher in elderlies.

**Key words:** Elderly, Coronary Artery Disease, Percutaneous Coronary Intervention (PCI), Major Adverse Cardiac and Cerebrovascular Events (MACCE)

## Introduction

The study was conducted with an objective to assess the outcome of percutaneous coronary intervention in elderly with increasing aging population and wide used of PCI but less utilized in elderly, this study with reference to safety and complications in a Pakistani population. One of the major challenges in percutaneous coronary intervention (PCI) is bleeding complications. The con-

tributing factors hypertension, females, cardiogenic shock use of GP11b/111a [1]. Some studies found that there is a difference in patients' comorbid in Japan and USA for prediction of mortality [2]. Some authors found that lean patients are at higher risk compared to obese patients for bleeding complications after PCI for in hospital patients [3]. In an Australian study involving 37,866 patients undergoing PCI [4]. The researchers observed the cardi-

ac and cerebrovascular adverse effects (MACCE) and bleeding. Major bleeding complications was uncommon while MACCE rate was higher. In another research the authors reported that access and non-access site bleeding occurred within 30 days of PCI and they were independently had a relationship with high risk of mortality within one year [5]. It was also reported that non-access site bleed was strongly correlated to mortality when compared with access site bleeding [6].

In meta-analysis of twenty-four randomized trials having 22,843 patients for coronary intervention, through femoral access or radial access [7]. It was found that mortality was less with radial access there was a reduction in vascular complications.

PCI is not widely used in older patients. The new anti-thrombotic therapy has played its role in this extensive use. This has reduced the ischemic complications to a great level. The antiplatelet agents used earlier have more complications particularly in elderly patients having serious comorbidities [8,9]. During recent years treatment for ST-elevation myocardial infarction (STEMI) has undergone a vast evolution. This has led to significant improvement in techniques for timely access to PCI. In an Australian study the researcher recorded a low mortality (6.5% overall) during thirty-day period. This mortality rate compares favorably with other studies [10]. In a study in Australia the authors concluded that bleeding is the result of poor clinical outcome and is responsible for increased hospitalization [10]. Hannan et al found that bleeding was higher in females after post PCI patients and were also related to late mortality [11]. However, the authors also concluded that gender was not assessed as an independent predictor for mortality. Bleeding events have been associated with high risk in dying in patients undergoing successful PCI [12].

Due to the increasing complexity the occurrence of post PCI ischemic stroke has increased over time. However, the data on the incidence in this regard are considered limited [13]. Acute coronary syndrome patients were at higher risk and more peri-procedural complications [14]. Elderly patients also suffering from comorbidity as well and were vulnerable to acute coronary syndrome. Marcus et al reported that for elderly patients of age more than eighty years undergoing PCI the risk of diabetes, renal failure impaired left ventricular function and three vessel coronary artery disease were higher in elderly Long-term mortality rate and in hospital death were higher in the elderly because of high risk patients with shock or STEMI underwent PCI [14]. Latest techniques in PCI use LV Support devices like LVAD has resulted in better outcomes after PCI in a study of PCI in elderly patients it was found that it is safe and effective for elderly patients to achieve complete myocardial revascularization, more so with the refined techniques and latest equipment. The need that a well-designed large randomized clinical trial comparing PCI, CABG and optimal medical therapy for the management of elderly patients should be done.

## Methodology

This was a retrospective chart review of 887 cases of percutaneous coronary intervention done at tertiary care hospital in Karachi, Pakistan. Karachi institute of heart diseases from 2015-2020. Consecutive sampling strategy was used. The sample was divided into

three groups

- Younger (age <65 years n=592),
- Older (age 65-75 years n=201) and
- Elderly (76 years and above n= 94).

Charts with missing data on and patient lost to follow up were excluded from the study data collection was carried out through a Performa based on relevant study variables Data was double entered in Epi Data version 3.1 and analyzed using Statistical Package for Social Sciences (SPSS) version 19.0 Categorical variables are described as percentages and compared using chi-square test or Fisher exact test as appropriated. Continuous variables were described as mean±SD and compared using independent sample test. Multivariate logistic regression analysis was carried out to estimate the Odds Ratios (OR) and their 95% Confidence Intervals (CI) with p-value of 0.05 was considered significant. Study variables included sociodemographic, co morbid, and PCI details (complexity of lesion, number of vessels involved, number of stents placed, procedure type (emergency or elective), use of IV anti coagulation, associated diagnosis of MI/cardiogenic shock. Data collection points included immediate as well as six monthly outcomes.

## Definition of Outcome Variables

- Vascular complication defined as hematoma at the site of arterial puncture, classified according to the American College of Cardiology (ACC) classifications, large  $\geq 10$  cm and small  $< 10$  cm.
- Major bleeding, according to criteria presented by CRUSADE, retroperitoneal hemorrhage (without surgical correction) major bleeding included those with hemodynamics instability defined by uncontrolled hypertension or hypotension, tachycardia or bradycardia or decreased oxygen saturation based on previous baseline parameters, surgical correction for any of the vascular complications of retroperitoneal hemorrhage, pseudoaneurysm arteriovenous fistula formation [15].
- Perioperative Myocardial infarctions (MI) is classically defined as a characteristic rise and fall in cardiac troponin (cTn) levels with at least one value higher than the 99th percentile of the upper reference limit (UNL) ( $> 0.014$  ng/mL), with at least one of the following features: defined as Ischemic nature of the chest pain new ECG changes new regional wall motion abnormality on echocardiogram [16].
- Successful PCI: PCI success was defined as achievement of vessel patency with a residual stenosis of  $< 20$
- In hospital mortality is defined all-cause mortality includes cardiac and non-cardiac causes. Six monthly follow up outcomes compared between the groups.

## Results

The baseline characteristics were shown in Table 1. Elderly more hypertensive than other groups 61% vs 49% with P value of 0.02, they had prior history of myocardial infarction 48% vs 26% with p value of 0,04, they had significant history of prior heart failure 2.1% vs 27% in elderly with value 0.05 Most elderly had previous coronary artery bypass surgery (CABG) and prior history of stroke 11% vs 1.5% p value 0.01, Elderly cohort was all high-risk feature

**Table 1: Bassline clinical and demographic characteristics in three cohorts**

| Risk factors               | Younger (<65 years) n 592 | Older (65-75%) | Elderly (>75 years) N 94 | P value |
|----------------------------|---------------------------|----------------|--------------------------|---------|
| Gender                     | Males n 180 F 113         | M = 85 F=54    | M 64 F 30                | 0.66    |
| Mean Age                   | 57 years                  | 69 years       | 77 years                 | 0.7     |
| Mean LV Function (EF)      | EF 50%                    | EF 40%         | EF 35%                   | 0.05    |
| Mean BMI KG/M2             | 28 KG/M2                  | 24M/KG2        | 22M/KG2                  | 0.06    |
| Hypertension               | 35%                       | 54%            | 61%                      | 0.02    |
| Diabetes                   | 34%                       | 66%            | 65%                      | 0.03    |
| Prior MI                   | 26%                       | 49%            | 48%                      | 0.04    |
| Prior CABG                 | 6%                        | 17%            | 27%                      | 0.03    |
| Prior stroke               | 2%                        | 8.3%           | 11%                      | 0.01    |
| Puerperal vascular disease | 0.7%                      | 5%             | 8%                       | 0.04    |

PCI chart in Table 2 PCI done for STEMI and cardiogenic shock in elderly with 11% vs 3.2% p value 0.01, elderly have more high-risk lesion defined as calcified, bifurcation ostial and long lesion greater than 10 mm in 78% of elderly group. Procedure success was same. In our study radial approach for PCI was used in 80% and femoral in 20%. Elderly has PCI was done by femoral in 30% while 70% were radial approach.

The relative risk of vascular complication in elderly n 23 with RR 4.3% with p value 0.5 not high as compares other cohorts. Vascular complication in elderly included hematoma in elderly greater 10 mm in n=8 patient and minor bleeding as drop of Hb 2 gm in n=11 patients and pseudoaneurysm n=4 patients and 48% patients received GP11b/111a and 20% elderly were lean mean BMI 20 kg/m2 and 34% of PCI were done for STEMI with increased used of unfractionated heparin.

**Table 2: PCI database showing indication, CAD complexity and success of PCI**

| PCI Data          | Younger<65 years) | Older(65-75yr) | Elderly (>75 years) | P value |
|-------------------|-------------------|----------------|---------------------|---------|
| STEMI             | 26%               | 28.5%          | 34%                 | 0.02    |
| Cardiogenic shock | 3.2%              | 6.8%           | 11%                 | 0.01    |
| High risk lesion  | 66%               | 84%            | 78%                 | 0.05    |
| Radial approach   | 88%               | 80%            | 70%                 | 0.7     |
| Triple vessel CAD | 17.7%             | 32%            | 48%                 | 0.01    |
| Use IABP          | 22%               | 35%            | 47%                 | 0.02    |
| Use of GP11b/111a | 48%               | 46%            | 45%                 | 0.67    |
| PCI success       | 96%               | 94.5%          | 90%                 | 0.57    |

The relative risk of perioperative myocardial infarction was not higher (OR ratio with 95% CI was 0.6 vs 0.3 vs 1.4 with p value 0.35). The need of repeat target revascularization was same in all the three groups with OR was (0.3 vs 0.2 vs 1.6 with p value 0.85). The relative risk of stroke following PCI was not high in elderly with OR (0.7 vs 0.4 vs 1.6 with p value 0.4). The in-hospital mortality was higher in elderly group of patients with relative risk (1% vs 2% vs 3.4% with p value of 0.03) in three groups.

The major cause of in hospital mortality in elderly was cardiac 42%, pneumonia 21% and Sepsis 22% and 15% Acute kidney injury. The six-month follow-up the total 84 patients were lost to follow up 12 patients from elderly group 24 from older group and 28 from younger group were lost to follow up and incomplete charts were found in 20 patients so analysis it was done in 803 patients. The outcome of repeat myocardial infarction in elderly was also

not higher than group, (OR 95% CI 0.5 vs 0.6 vs 0.7 with p value 0.58) The need of repeat target revascularization was also not high in elderly as compared to other groups with OR (1 vs 2.5 vs 2 with p value of 0.6) The six months follow up mortality was higher in elderly group with relative risk of (1.5% vs 3.4% vs 4% and p value was 0.04) Six-month review of mortality in elderly n=88 patients was cardiac in 56% and non-cardiac 44%.

### Discussion

our study showed that PCI was successful and complications are not high although in hospital mortality and six-month mortality was high like previous study [17]. In our study, the six month mortality rate elderly population a is consistent with the Abdullah study in which all-cause mortality in patient 65-74 years was 10.1% and 20.4% in patients  $\geq 75$  undergoing PCI in our study it was 3% vs 4.5% may be number of elderlies were 94 in our

study and upon six month follow-up the mortality rate among the elderly was high which is not like 3-year mortality rates for elderly were comparable to previous studies in which 3-year all cause death in elderly patients with mean age of 88 years old treated with PCI were 33.3%, and treated with conservative management were 52.4% [18].

In our study elderly have more comorbid like heart failure, prior myocardial infarction their presentation and PCI data showed more high risk lesion, three vessel diseases and mostly PCI done in emergency as compared to elective with cardiogenic shock, and STEMI which have effect on in hospital and six month mortality results similarly Previous studies showed that preoperative factors influencing mortality in elderly treated with invasive or conservative strategy are cardiogenic shock, previous cardiac surgery, renal failure, age, hypertension, heart rate and anemia [19]. Our study elderly although lean there was no significant post PCI vascular complication because of radial approach reported study reported same results [20]. Shashank et al study the effect of bleeding severity in PCI and effect on mortality according to their study no major bleeding [21]. Procedure success and complication were not different from other group like TIMI III flow no post procedure MI and stroke similarly results were reported from Japanese largest PCI registry on octogenarians [22].

Our results are in line with previous findings by showing that the elderly patients can get benefit of PCI not only at in hospital but-year but also six-years. Recently a randomized study aimed to investigate whether elderly patients with NSTEMI or unstable angina would benefit from an early invasive strategy versus a conservative strategy and showed similar results as ours [23]. In our study STEMI is a large proportion of the total PCI in elderly. Second, as many other trials randomized study was subject to many exclusions such as cardiogenic shock, continuing bleeding problems, short life expectancy [24]. This was not the case in our study. Therefore, our study is closer to the “real world” of the clinical practice. The decision to proceed with a PCI procedure in the elderly is influenced by numerous factors. Non-cardiac comorbidities include renal, cerebral, pulmonary and vascular disease were often considered prior to decision making for PCI [25].

In our study was retrospective review of PCI in elderly and cohort were high risk but success of PCI was reflected in our cohort of elderly patients. The all-cause mortality in hospital and at six months may be confounded by high-risk elderly we need large randomized study with long follow up with matched risk factors to recommend the PCI is safe option in elderly as compare managing on medicines

**Limitations and strengths:** Despite our effort include as much information as possible in medical records, and despite we cannot rule out potential confounding from unmeasured variables. Many patients are lost to follow up. Nevertheless, our data are encouraging and serve as the basis for randomized trials in the future. One of the main strengths is that all patients were included from our daily clinical practice, and therefore representative.

## Conclusion

The procedure success in elderly patients was same as compared

to younger patients but in hospital and six months follow up mortality rate was higher in elderly as compared to young groups. This could be underlying high risk presentation at the time of PCI.

## References

1. Numasawa Y, Kohsaka S, Ueda I, Miyata H, Sawano M, et al. (2017) Incidence and predictors of bleeding complications after percutaneous coronary intervention. *Journal of cardiology* 69: 272-279.
2. Kohsaka S, Miyata H, Ueda I, Masoudi FA, Peterson ED, et al. (2015) An international comparison of patients undergoing percutaneous coronary intervention: a collaborative study of the National Cardiovascular Data Registry (NCDR) and Japan Cardiovascular Database-Keio interhospital Cardiovascular Studies (JCD-KiCS). *American heart journal* 170: 1077-1085.
3. Numasawa Y, Kohsaka S, Miyata H, Kawamura A, Noma S, et al. (2015) Impact of body mass index on in-hospital complications in patients undergoing percutaneous coronary intervention in a Japanese real-world multicenter registry. *PloS One* 10: e0124399.
4. Ndrepepa G, Neumann FJ, Richardt G, Schulz S, Tölg R, et al. (2013) Prognostic value of access and non-access sites bleeding after percutaneous coronary intervention. *Circulation: Cardiovascular Interventions* 6: 354-361.
5. Bellemain-Appaix A, Brieger D, Beygui F, Silvain J, Pena A, et al. (2010) New P2Y12 inhibitors versus clopidogrel in percutaneous coronary intervention: a meta-analysis. *Journal of the American College of Cardiology* 56: 1542-1551.
6. Ferrante G, Rao SV, Jüni P, Da Costa BR, Reimers B, et al. (2016) Radial versus femoral access for coronary interventions across the entire spectrum of patients with coronary artery disease: a meta-analysis of randomized trials. *JACC: Cardiovascular Interventions* 9: 1419-1434.
7. Gao Y, Zhang F, Li C, Dai Y, Qu YN, et al. (2019) Optimal strategy of primary percutaneous coronary intervention for acute myocardial infarction due to unprotected left main coronary artery occlusion (OPTIMAL): study protocol for a randomised controlled trial. *Trials* 20: 1-8.
8. Doyle BJ, Rihal CS, Gasteineau DA, Holmes DR (2009) Bleeding, blood transfusion, and increased mortality after percutaneous coronary intervention: implications for contemporary practice. *Journal of the American College of Cardiology* 53: 2019-2027.
9. Biswas S, Duffy SJ, Lefkovits J, Andrianopoulos N, Brennan A, et al. (2018) Australian trends in procedural characteristics and outcomes in patients undergoing percutaneous coronary intervention for ST-elevation myocardial infarction. *The American journal of cardiology* 121: 279-288.
10. Wlodarczyk J, Ajani AE, Kemp D, Andrianopoulos N, Brennan AL, et al. (2016) Incidence, predictors and outcomes of major bleeding in patients following percutaneous coronary interventions in Australia. *Heart, Lung and Circulation* 25: 107-117.
11. Idris H, French JK, Shugman IM, Hopkins AP, Juergens CP, et al. (2017) Influence of age and gender on clinical outcomes following percutaneous coronary intervention for acute coronary syndromes. *Heart, Lung and Circulation* 26: 554-565.
12. Redfors B, Généreux P, Witzenbichler B, Kirtane AJ, McAndrew T, et al. (2018) Bleeding severity after percutaneous cor-

- onary intervention. *Circulation: Cardiovascular Interventions* 11: e005542.
13. Alkhouli M, Alqahtani F, Tarabishy A, Sandhu G, Rihal CS (2019) Incidence, predictors, and outcomes of acute ischemic stroke following percutaneous coronary intervention. *JACC: Cardiovascular Interventions* 12: 1497-1506.
  14. Iverson A, Stanberry LI, Tajti P, Garberich R, Antos A, et al. (2019) Prevalence, trends, and outcomes of higher-risk percutaneous coronary interventions among patients without acute coronary syndromes. *Cardiovascular Revascularization Medicine* 20: 289-292.
  15. Subherwal S, Bach RG, Chen AY, Gage BF, Rao SV, et al. (2009) Baseline risk of major bleeding in non-ST-segment-elevation myocardial infarction: the CRUSADE (can rapid risk stratification of unstable angina patients suppress Adverse outcomes with early implementation of the ACC/AHA guidelines) bleeding score. *Circulation* 119: 1873-1882.
  16. Landesberg G, Beattie WS, Mosseri M, Jaffe AS, Alpert JS (2009) Perioperative myocardial infarction. *Circulation* 119: 2936-2944.
  17. Avezum A, Makdisse M, Spencer F, Gore JM, Fox KA, et al. (2005) Impact of age on management and outcome of acute coronary syndrome: observations from the Global Registry of Acute Coronary Events (GRACE). *American heart journal* 149: 67-73.
  18. Damluji AA, Bandeen-Roche K, Berkower C, Boyd CM, Al-Damluji MS, et al. (2019) Percutaneous coronary intervention in older patients with ST-segment elevation myocardial infarction and cardiogenic shock. *Journal of the American College of Cardiology* 73: 1890-1900.
  19. Barywani SB, Li S, Lindh M, Ekelund J, Petzold M, et al. (2015) Acute coronary syndrome in octogenarians: association between percutaneous coronary intervention and long-term mortality. *Clinical interventions in aging* 10: 1547-1553.
  20. Völz S, Angerås O, Koul S, Haraldsson I, Sarno G, et al. (2019) Radial versus femoral access in patients with acute coronary syndrome undergoing invasive management: A prespecified subgroup analysis from VALIDATE-SWEDEHEART. *European Heart Journal: Acute Cardiovascular Care* 8: 510-519.
  21. Murali S, Vogrin S, Noaman S, Dinh DT, Brennan AL, et al. (2020) Bleeding Severity in Percutaneous Coronary Intervention (PCI) and Its Impact on Short-Term Clinical Outcomes. *Journal of clinical medicine* 9: 1426.
  22. Sawano M, Yamaji K, Kohsaka S, Inohara T, Numasawa Y, et al. (2020) Contemporary use and trends in percutaneous coronary intervention in Japan: an outline of the J-PCI registry. *Cardiovascular intervention and therapeutics* 35: 218-226.
  23. Navarese EP, Rao SV, Krucoff MW (2019) Age, STEMI, and Cardiogenic Shock: Never Too Old for PCI? *Journal of the American College of Cardiology* 73: 1901-1904.
  24. Kumar S, McDaniel M, Samady H, Forouzandeh F (2020) Contemporary revascularization dilemmas in older adults. *Journal of the American Heart Association* 9: e014477.
  25. Shanmugam VB, Harper R, Meredith I, Malaiapan Y, Psaltis PJ (2015) An overview of PCI in the very elderly. *Journal of geriatric cardiology: JGC* 12: 174-184.

*Copyright:* ©2021 Sumera Nasim, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.