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INCIDENCE OF POSTOPERATIVE THROMBOCYTOPENIA IN CORONARY ARTERY BYPASS GRAFT PATIENTS AND ITS OUTCOMES

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ABSTRACT

Aim: To determine the incidence of postoperative thrombocytopenia in coronary artery bypass graft patients and its outcomes
Methodology: This prospective study was conducted in in Department of Cardiac Surgery, National Institute of Cardiovascular Diseases, Karachi, Pakistan from Jan 2025 to Jun 2025. All admitted patients for CABG, both genders categorized as ASA type 1,2 & 3, having age 40 to 80 years were included in the study. Patients having thrombocytopenia before CABG surgery, with septicaemia after CABG surgery (secondary infection), with multi organ failure after CABG surgery, with drug induced thrombocytopenia before CABG surgery and with bone marrow suppression before CABG surgery were excluded from the study. Postoperatively each patient was evaluated for any haemorrhage, MI, stroke, acute kidney disease (AKI) and respiratory distress on daily basis till 30th day postoperatively. Microsoft excel was used for data analysis.
Results: Out of 310 patients who undergone CABG males were 48.4% and females were 51.6%. The mean age of them being 59.2±9.25 years. Incidence of thrombocytopenia was 16.1% with female predominance. Thrombocytopenia was significantly associated with female gender. It was not associated with BMI, duration of disease. Significant outcomes of thrombocytopenia were acute kidney disease and stroke.

Conclusion: The result of this study reveals that post CABG patients with postoperative thrombocytopenia are having increased risk of developing acute kidney disease, bleeding tendency, mortality and chances of stroke. Further studies are needed for validation of these results while utilizing data from other medical centres. Research into the possible mechanism of postoperative thrombocytopenia and how it will possibly relate to adverse outcomes should be undertaken.

INTRODUCTION

Ischemic heart diseases (IHD), otherwise known as coronary artery disease (CAD), have continued to pose a considerable health burden to varying extents across the globe. This disorder arises because of the partial narrowing of semi-obstruction of coronary arteries that supply oxygenated blood to the heart muscle. Indeed, CAD is one of the major contributors to global morbidity and mortality and is implicated in several cardiovascular events such as heart attacks (myocardial infarctions) and angina.[1,2] In the twenty-first century, IHD is recognized as a significant danger to sustainable development. Atherosclerosis, the progressive building up of plaque inside the artery walls, is usually the cause of the development of CAD. Calcium, fatty materials, cholesterol, and other cellular waste make up plaque. Plaque accumulation causes the coronary arteries to constrict over time, limiting blood flow to the heart muscle. The heart is deprived of vital oxygen and nutrients due to this decrease in blood flow, which can result in ischemia (insufficient blood flow) and possibly damage to the heart tissue.[3,4]

The management of ischemic heart disease involves non-invasive primary prevention (lifestyle modifications, dietary changes, and alterations in physical activity pattern) and secondary prevention (blood pressure control, management of lipids and diabetes mellitus, and antiplatelet agents, β-blockers, and agents affecting the renin-angiotensin-aldosterone system) coupled with invasive revascularization through either percutaneous coronary intervention (PCI) or coronary artery bypass graft (CABG) surgery.[1]

CABG surgery leads to platelets activation resulting in thrombocytopenia in some patients. Complications that can arise during coronary artery bypass graft (CABG) surgery include acute respiratory distress syndrome (ARDS), acute myocardial infarction (AMI), strokes, massive bleeding, acute kidney injury (AKI), major bleeding, and resultant mortality.[5-7] Moreover, antiplatelet therapy is given to all patients following coronary artery bypass surgery so as to keep the grafted vessels patent so as to prevent graft failure and avoid any major cardiovascular event. Among the antiplatelet agents, aspirin is considered as the first line antiplatelet drug used in CABG surgery.[8,9] Both of these underlying causes are responsible for postoperative thrombocytopenia in CABG patients.

The study aimed to address a significant gap in our understanding of postoperative thrombocytopenia incidence among CABG (Coronary Artery Bypass Grafting) patients within our local population. As of the present date, no such investigation has been conducted.

METHODOLOGY

This prospective descriptive cross-sectional study was conducted in Department of

Cardiac Surgery, National Institute of Cardiovascular Diseases, Karachi, Pakistan from Jan 2025 to Jun 2025. Sample size was calculated as 310 patients with onpump CABG, using 28%[5] as incidence of postoperative thrombocytopenia in patients with CABG, margin of error 5%, confidence level 95% using WHO sample size calculator. Ethical approval of the study was obtained from the ethical committee of National Institute of Cardiovascular Diseases, Karachi, Pakistan. All admitted patients for CABG, both genders categorized as ASA type 1,2 & 3, having age 40 to 80 years were included in the study. Patients having thrombocytopenia before CABG surgery, with septicaemia after CABG surgery (secondary infection), with multi organ failure after CABG surgery, with drug induced thrombocytopenia before CABG surgery and with bone marrow suppression before CABG surgery were excluded from the study. Age, ASA status and duration of heart vessels disease (in years) for which CABG is advised, were noted. A detailed history about prior thrombocytopenia, any drug used causing thrombocytopenia, and any bone marrow suppression will be taken and complete physical examination of the patients were performed. Each patient undergone CABG surgery using saphenous graft using slandered operating protocols. Postoperatively each patient was admitted in ICU monitoring vitals. Each patient was started on antiplatelet therapy. Each patient was evaluated for any hemorrhage, stroke, acute kidney disease (AKI) and respiratory distress on daily basis. 5 ml blood will be taken from the patient and sent to the hospital laboratory for platelets level, serum creatinine and blood urea estimation on daily basis. In case of stroke suspicion CT brain was obtained along with neurology opinion and will be managed accordingly. In case of MI suspicion troponin I and T was determine and managed by cardiology. Any ARDS symptoms was confirmed by chest x ray and pulmonology management was obtained. Acute renal failure was managed by nephrology. Any bleeding was managed by changing the drug regimens and supportive measures like blood and platelets transfusion and reopening of the patient. The patient was sent home once stable according to hospital protocol. Each patient was followed till 30th day postoperatively for any complication and final outcome was assessed till this point of time.

Data will be analyzed using SPSS 25.0. Quantitative variables were described as mean and standard deviation. Categorical variables were described as frequency and percentages. Chi square test was applied keeping the p value ≤ 0.05 as statistically significant.

RESULTS

Three hundred ten patients who undergone on pump CABG were analyzed. The mean age of them being 59.2±9.25 years. The gender distribution was almost equal: males constituted 48.4% and females 51.6%. Thrombocytopenia, defined as <150,000/µL platelets, was detected in 50 patients (16.1%), while the other 260 subjects (83.9%) exhibited normal platelet counts, fig 1.

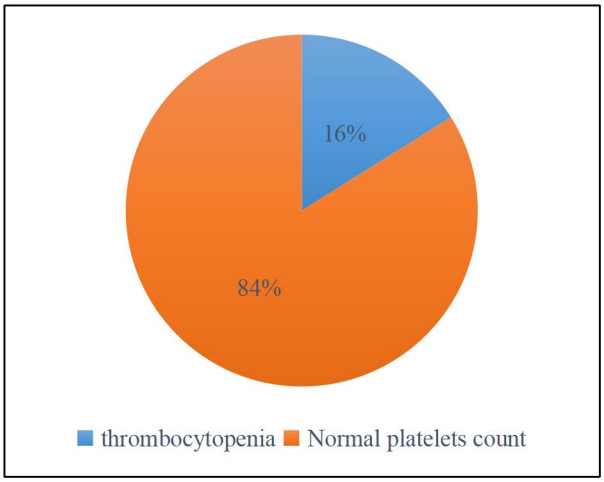

Fig. 1. Prevalence of thrombocytopenia

The gender difference demonstrated significant difference in the prevalence of thrombocytopenic subjects ($p = 0.017$), with a slight predominance was noted in females.

The different body mass index (BMI) categories (≤25, >25-30, and >30) have no association with thrombocytopenia (p=0.90); hence, obesity was not one of the major associations. Moreover, it should be noted that the longer the existing diseases (≥5 years' duration), there tended to be more thrombocytopenic patients (p=0.056), implying that the influence of time would have made less platelets available for the prolonged cardiovascular disease, Table 1.

Variable	Category	No	%	P value
Gender	Male Female	16 34	32% 68%	0.017438
BMI	≤25 >25-30 >30	3 18 29	6% 36% 58%	0.904309
Disease duration	< 5 years ≥ 5 years	19 31	38% 62%	0.056068

Table 1, Association of thrombocytopenia with various variables

Thrombocytopenia had a significant relation with acute kidney injury, that is 68% (34/50) of thrombocytopenic patients as compared to 49.2% (128/260) among those without thrombocytopenia (p=0.037). This proved that low platelet levels tended to worsen renal dysfunction following CABG. Mortality rates also were higher in thrombocytopenic patients (8% or 4 of 50 patients) than non-thrombocytopenic patients (2.3% or 6 of 260 patients) (p=0.037), thus strengthening the probability of this association of thrombocytopenia as having adverse outcomes. However, there was no significant association of thrombocytopenia with hemorrhage (p=0.82) or stroke (p=0.24), which indicated that bleeding events were not out of proportion connected with low platelet counts in this cohort,

Table 2.

Variable	Category	No	%	P value
Hemorrhage	Yes No	10 40	20% 80%	0.815363
Stroke	Yes No	2 48	4% 96%	0.242133
AKI	Yes No	34 16	68% 32%	0.037299
Mortality	Yes No	4 46	8% 92%	0.03695

Table 2, Outcomes of thrombocytopenia in post CABG patients

Mean platelet count was very much reduced in thrombocytopenic patients (approximately 90,000/μL) than in normal individuals (approximately 180,000/μL). However, despite this difference, the incidents of major bleeding complications were low, indicating that the cause of hemorrhage in CABG in this cohort was more likely not due to thrombocytopenia rather than spontaneous hemorrhage.

On further stratification by severity of disease including those with AKI, thrombocytopenic patients exhibited worse prognosis by significantly less events of p=0.037. However, those with only thrombocytopenia showed comparable rates of stroke or hemorrhage. This, therefore, implies that thrombocytopenia could act synergistically along with other postoperative complications, mainly AKI. We encountered no patients with acute MI or any ARDS in our study population.

DISCUSSION

Platelets activation are involved in the pathogenesis of many organ dysfunctions, including ARDS, AMI, stroke, massive blood loss, and AKI, and could serve as one prognostic indicator of great determination in critical patients..[5,10–13] Thrombocytopenia or decreased platelets count may be associated end-organ injury due to inflammatory processes started after cardiac surgery.[7] Postoperative thrombocytopenia after CABG

is a well-known complication. The increased risk of perioperative bleeding and reduced platelet count in CABG patients receiving antiplatelet medication puts them at a greater risk for developing postoperative thrombocytopenia. Systemic organ dysfunction can also be reflected by decreased platelet count; therefore, thrombocytopenia in patients undergoing CABG is related to bleeding events and predicts other adverse events following surgery, including acute kidney injury, stroke, and acute myocardial infarction. Evaluating the impact of perioperative thrombocytopenia in patients undergoing CABG has compelling significance.[5,14-15]

In our study 16.1% patients were found to be suffering from thrombocytopenia after CABG surgery. Similar results were presented by Li et al in their study where they found that 14.2% of the study participants in their study were having thrombocytopenia after CABG surgery.[7] Griffin et al in their study found that postoperative thrombocytopenia after CABG surgery was 26%.[16] The differences of results between our study and that of Griffin et al may be due to the fact that they have observed a very huge sample as compared to ours, but still our results are comparable to other international studies. It means there are some regional variations among the patients leading to different results for post CABG thrombocytopenia.

In our study most of the patients who developed postoperative thrombocytopenia were female being 68% and only 32% of male population developed thrombocytopenia after CABG with p value of 0.017 which is statistically significant. In the study by Griffin et al also female population predominantly suffered from postoperative thrombocytopenia.[16] In a study by Kertai et al also the predominant population who suffered from thrombocytopenia was female.[5]

In our study BMI and duration of disease (p value of 0.9043 & 0.0560 respectively) were not significantly associated with thrombocytopenia. Through literature search shows that none of the researchers have studied these parameters in association with postoperative thrombocytopenia in CABG surgery.

In our study haemorrhage occurred in 20% of thrombocytopenic patients but it was not statistically significant (p= 0.8153). Our results were nearly comparable to that of Rodino et al in this regard where major bleeding occurred in 27.3% patients.[6]

We observed stroke in 4% of thrombocytopenic patients with p value of 0.2421 (statistically not significant). A study by Nammas et al also shows that 1.2% of the thrombocytopenic patient exhibited stroke post CABG but their results were also statistically non-significant with p value of 0.946.[10] Study by Griffin et al showed that 4.2% patients with thrombocytopenia exhibited stroke after CABG.[16] Karhausen et al found postoperative stroke in 1.8% patients undergoing CABG and having postoperative thrombocytopenia.[17] Results of both of the later studies were statistically significant. This discrepancy in our results and their results may be due to the greater number of study populations observed by all other researchers as compared to ours.

We found that 68% patients in thrombocytopenic group exhibited with acute kidney disease with p value of 0.0372 which was statistically significant. Some other studies also reported that, postoperative thrombocytopenia is associated with acute kidney injury after CABG surgery.[5] Study by Karhausen et al is also having the same observations.[17] Study by Kertai et al showed that 71.50% thrombocytopenic population were suffering from acute kidney disease post CABG, 51%, 13% and 7% in stage I, II, and III of kidney disease respectively with statistically significant result.[5]

A study comprised of 7,189 CABG surgery subjects, having thrombocytopenia was also

associated with high risk of mortality.[10] On the contrary, another study, including 348,341 CABG patients, found no association of thrombocytopenia with mortality after CABG surgery.[18] The mortality rate in our cohort of thrombocytopenic patients post CABG was 8% with p value of 0.03695 (statistically significant). In study by LI et al the total mortality was 3% with statistically significant results.[7]

CONCLUSION

The results of this study reveals that post CABG patients with postoperative thrombocytopenia are having increased risk of developing acute kidney disease, bleeding tendency, mortality and chances of stroke. Further studies are needed for validation of these results while utilizing data from other medical centers. Research into the possible mechanism of postoperative thrombocytopenia and how it will possibly relate to adverse outcomes should be undertaken.

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