



Original Article

Age-related Increase in Incidence of Postoperative Atrial Fibrillation Following Coronary Artery Bypass Grafting (CABG) Surgery

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ABSTRACT

Atrial Fibrillation (AF) is one of the common arrhythmias after coronary artery bypass grafting (CABG) mostly occurs within 2 to 4 days. The advanced age is one of the important risk factors.

Objective: To determine the frequency of Postoperative Atrial Fibrillation (POAF) in patients age between 30-65 years who underwent elective CABG Surgery. **Methods:** One hundred and thirty-seven Adult patients of either sex between age of 30 to 65 years with three vessel coronary artery disease underwent elective CABG surgery were included in our study. It was descriptive cross-sectional study, conducted at Tabba Heart Institute, Karachi, from December 2021 to June 2022. Postoperatively daily EKG was performed for the evidence of POAF. **Results:** One hundred and thirty-seven patients, between age group of 30-65 years among them 115 (84%) were male & 22 (16%) were females with mean age of patients 55.91 years were included in our study. Post-Operative Atrial Fibrillation (POAF) was observed in 12.4%, out of whom 76.5% were male while 23.5% were female. The mean day of onset of POAF was 2.38 days. The relationship between increasing age groups and AF was found to be statistically significant i.e. p-value 0.04. There is significant difference between age groups and maximum incidence of POAF were found in above 60 years. **Conclusions:** In our study frequency of POAF was found in 12.4% with mean age of participants was found to be 55.91±6.5 years.

INTRODUCTION

Atrial Fibrillation (AF) is one of the common arrhythmias that occurs after coronary artery bypass grafting which prolongs hospital stay [1]. The incidence of postoperative AF (POAF) is 15% to 30% after isolated coronary artery bypass grafting (CABG) surgery [2]. But this incidence is lower as compared to those patients who underwent valve surgery or CABG with valve surgery [3]. Previous studies showed the incidence of POAF between 20% and 50%, depending on definitions and methods of detection. Atrial

fibrillation is common but potentially preventable complication following CABG surgery. The advanced age (>70 years), low left ventricular ejection fraction (<30%), obesity, diabetes, prolong cross-clamp and bypass time are the important risk factors [1, 3, 4]. Atrial fibrillation occurs within 2 to 4 days after coronary artery bypass grafting. Peak incidence is on 2nd postoperative day. Seventy percent (70%) POAF occurs before the end of 4th post-operative day and 94% before the end of 6th post-

operative day [4]. Studies showed male predisposition while according to others there is no differences in male sex predisposition [3]. The mechanism of POAF is still unclear [1], although it is believed that POAF occur due to preexisting degenerative changes in atrial muscle which serves as abnormal atrial substrate related to age [3, 5]. Prolong bypass and cross-clamp time are important predictors of POAF. Other predictors include advancing age as atrial dilatation and fibrosis occurs that slows electrical conduction through atrial muscle fibers [3, 6]. POAF is associated with significant adverse effects and also increase length of hospital stay leading to expenses. It is also associated with hospital readmissions in those patients who underwent on-pump coronary artery bypass grafting [6, 7]. Despite the prevalence of studies on postoperative atrial fibrillation (POAF) following CABG surgery, there remain a significant gap in research focusing on the age group between 30 to 65 years. This age range represents a substantial portion of the population undergoing elective CABG procedures, yet the frequency of POAF specifically within this cohort remains poorly understood. Therefore, this study aimed to fill this knowledge gap by investigating the incidence of POAF in patients aged 30 to 65 years who have undergone elective CABG surgery in our local population for better understanding of associated risk factors and to develop targeted prevention strategies, and enhance patient care outcomes.

METHODS

One hundred and thirty-seven patients who were meeting the inclusion criteria were included in the study. All the patients underwent elective CABG surgery between December 2021 to June 2022 (6 months). It was descriptive cross-sectional study that was conducted at Tabba Heart Institute, Karachi, Pakistan. Adult patients of both sexes between ages of 30 to 65 years with 3 vessel coronary artery disease diagnosed on angiography who underwent elective CABG surgery were chosen via convenient sampling. The sample size was calculated using WHO Openepi sample size calculator with estimated incidence of Postoperative Atrial Fibrillation following CABG surgery as 9.84% [8] with margin of error as 5% and confidence interval of 95%. Postoperatively daily EKG was performed for the evidence of POAF. Patients who underwent valve surgery or had CABG with Valve surgery, Redo-CABG, off-Pump CABG (OPCAB), Emergency CABG and patients having pre-operative atrial fibrillation were excluded from the study. Data were analyzed by SPSS version 21.0. Mean \pm SD was calculated for quantitative variables such as age and postoperative day of AF onset. Percentages were calculated for qualitative variable e.g., gender, development of AF. Stratification with respect to age and

gender was done and chi-square test was applied to see the effect to these on outcome variables. $p < 0.05$ was taken as significant.

RESULTS

One hundred and thirty-seven patients were included in our study, between age group of 30–65 years among them 115 (84%) were male & 22 (16%) were female (Table 1). Mean age of patients in our study was found 55.91 years (Table 1). Out of 137 patients Post-Operative Atrial Fibrillation (POAF) was observed in 12.4% (Table 1), out of them 13 (76.5%) were male while 04 (23.5%) were female (Figure 2). The mean age of patients with POAF was 55.91 years (Table 1). The mean day of onset of POAF was 2.38 days (Table 1).

Table 1: Frequency of different variables

Variables	Frequency (%)	
Atrial Fibrillation	Yes	17 (12.4%)
	No	120 (87.6%)
Gender	Male	115 (84%)
	Female	22 (16%)
Mean Onset of AF	2.38 \pm 1.2 days	
Mean Age of AF	55.91 \pm 6.5 years	

In the age group more than 60 years, 71% of individuals had atrial fibrillation (AF), while 29% did not have AF. However, in the age group up to 60 years, a higher proportion (82%) of individuals were free from AF, while only 18% had AF. These findings suggest that the prevalence of atrial fibrillation is higher in the older age group compared to the younger age group (Figure 1). Chi square inferential analysis of Age groups and AF showed that age groups are associated with risk of POAF p -value 0.04 which is significant (Figure 1). There is significant difference between age groups and maximum incidence of POAF were found in above 60 years.

Age distribution of patients with atrial fibrillation

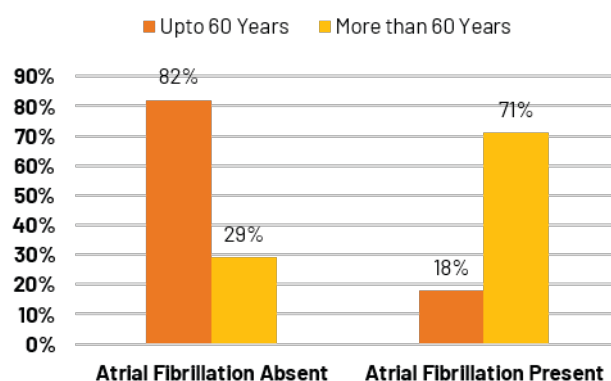


Figure 1: Age Distribution among Patients with Atrial Fibrillation Gender Distribution among Patients with Atrial Fibrillation shown in figure 2.

Gender Distribution of Patients with Atrial Fibrillation

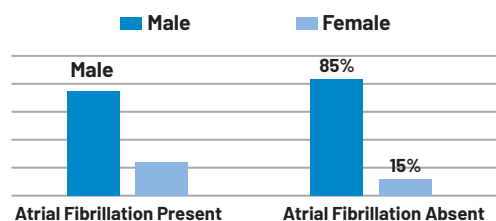


Figure 2: Gender Distribution among Patients with Atrial Fibrillation

DISCUSSION

Atrial fibrillation is common but potentially preventable complication following CABG surgery. The advanced age, obesity, diabetes, low ejection fraction, prolong cross-clamp and bypass time are the important risk factors [3-6]. Studies reported incidence of Atrial fibrillation after CABG is approximately 15-30% in the immediate postoperative period [7] and it can prolong the ICU and hospital stay so increases the hospital cost [1, 4, 5]. CABG is commonly complicated by the dysrhythmia, Atrial Fibrillation. CABG Patients who develop new-onset post-operative Atrial Fibrillation (POAF) had in hospital, 30 days and the long-term mortality is higher than the one who do not develop POAF [8, 9]. A meta-analysis showed that patients who underwent isolated CABG and developed POAF had in hospital mortality 2.61 times more than those who did not develop POAF [8-10]. Another meta-analysis conducted by Phan *et al.*, showed approximately twice mortality within 30 days of CABG in those who developed AF than those who did not have POAF [8-10]. POAF causes prolonged hospital stay. Phan *et al.*, noted CABG surgery recovery is prolonged in patients who develop POAF. Phan *et al.*, documented association between stroke, respiratory failure and post-CABG A [8]. The other studies documented association of POAS with prolonged ventilation, sternal wound infection, and multiorgan failure [11, 12]. Studies showed peak incidence of AF is on 2nd postoperative day [4], while in our study it was 2.3 days with SD of 1.20 days. In our study the frequency of atrial fibrillation was found 12.4% which was common on the 2nd post-operative day. Studies have found increased incidence of atrial fibrillation in male patients after CABG [13-15] whereas others reported no difference in male sex predisposition [16, 17]. It is probably related to the lack of sufficiently large sample of women in these studies [18, 19]. In our study 137 patients were included out of which 17 patients developed POAF in which 13(76.5%) were males and 4(23.5%) were female. Despite the frequent occurrence of atrial fibrillation after cardiac surgery, little is known about the pathogenesis of this arrhythmia [20]. In our study 12.4% incidence of POAF was found in patients with mean age of 55.91 years with SD 6.5.

In our study the majority of patient who develop POAF were above 60 year of age that similar to result conducted by Ismail *et al.*, [21] Advanced age increases the risk of AF because dilatation and fibrosis of atria have been shown to increase with age [11] with a loss of side to side electric coupling between groups of atrial muscle fibers [12]. Consequently, slowing of electric conduction with in the atria provides a substrate for arrhythmogenesis. The mechanism of POAF is still unclear [1], although it is believed that POAF occur due to preexisting degenerative changes in atrial muscle which serves as abnormal atrial substrate related to age [3, 5]. Advanced age, obesity, diabetes mellitus, low EF (< 30%), Prolong bypass and cross-clamp time are important predictors of POAF. In advancing age there is atrial dilatation and fibrosis occurs that slows electrical conduction through atrial muscle fibers [3, 6]. In our study none of our patient had low E.F (< 30%), and all were non-diabetics and none was found obese. Study by Phan *et al.*, documented 9.4% to 47.7% incidence rate of POAF after CABG, however others reported 20% to 40 % [8]. Preoperative identification of individuals will facilitate the timely treatment of high-risk individual and so will decrease the hospital stay and cost [8-10, 20].

CONCLUSIONS

In our study frequency of POAF was found 12.4 % (17 patients) with mean age of 55.91 years with SD 6.5. Advance Age found to be a risk factor to development of POAF so when CABG performed in older age so extra care and vigilance should be given pre-operative intraoperative and post operatively.

Authors Contribution

Conceptualization: SA

Methodology: RT, AK, AAK, MS

Formal analysis: RT, SA

Writing-review and editing: SL, AAK, AK

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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