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Original Research Article

CARDIOVASCULAR RISK FACTOR BURDEN IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFTING: A CLINICAL ANALYSIS

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ABSTRACT

Background: Coronary artery disease (CAD) remains one of the leading causes of morbidity and mortality worldwide. In patients with severe or advanced disease, coronary artery bypass grafting (CABG) is an established surgical procedure that helps restore adequate blood flow to the heart. Understanding the demographic characteristics and cardiovascular risk factor profile of patients undergoing CABG is important for improving clinical management and long-term outcomes. The objective is to evaluate the demographic profile, clinical parameters, and major cardiovascular risk factors among patients undergoing coronary artery bypass grafting.

Materials and Methods: This observational descriptive study included 200 patients who underwent CABG at a tertiary care center. Data on demographic variables, clinical parameters, and comorbid conditions such as hypertension, diabetes mellitus, dyslipidemia, chronic kidney disease, and heart failure were collected. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequency and percentage. Chi-square test, independent sample t-test and Pearson correlation were applied where appropriate, with a p-value <0.05 considered statistically significant.

Results: The mean age of patients was 61.8 ± 10.7 years, and males constituted the majority of the study population (78%). Hypertension was the most common risk factor (55%), followed by diabetes mellitus (33.5%), hypercholesterolemia (24%), hypertriglyceridemia (21%), heart failure (18%), and chronic kidney disease (13.5%). A significant positive correlation was observed between age and systolic blood pressure ($r = 0.28$, $p = 0.002$) as well as between age and blood glucose levels ($r = 0.21$, $p = 0.01$).

Conclusion: Patients undergoing CABG were predominantly older males with a high burden of cardiovascular risk factors, particularly hypertension and diabetes. Early identification and effective management of these modifiable risk factors may help reduce disease progression and improve clinical outcomes.

Keywords: Coronary artery disease, Coronary artery bypass grafting, Cardiovascular risk factors, Hypertension, Diabetes mellitus, Dyslipidemia.

INTRODUCTION

Coronary artery disease (CAD) remains one of the leading causes of illness and death from cardiovascular conditions worldwide. It occurs when the coronary arteries gradually become narrowed due to the buildup of atherosclerotic plaques, reducing blood flow to the heart muscle. When this reduced blood supply becomes severe or leads to significant symptoms, revascularization may be required to restore adequate circulation. Among the available treatment options, coronary artery bypass grafting

(CABG) continues to be a well-established and effective surgical procedure for patients with advanced or complex coronary artery disease.[1] Several demographic and clinical factors contribute to the development and progression of coronary artery disease. The cardiovascular risk factors such as hypertension, diabetes mellitus, dyslipidemia, and chronic kidney disease significantly increase the likelihood of adverse cardiovascular events.[2] In patients requiring CABG, these risk factors may also influence preoperative complications and long-term outcomes.

Understanding the baseline demographic characteristics and associated comorbid conditions in patients undergoing CABG is essential for risk stratification and improved clinical management.[3] Therefore, the present study aimed to provide an overview of the demographic profile and major cardiovascular risk factors among patients undergoing coronary artery bypass grafting.

MATERIALS AND METHODS

This observational descriptive cross-sectional study evaluated patients undergoing CABG. Ethical approval for this study was granted by the Institutional Ethics Committee of Sawai Man Singh Medical College, Jaipur (Ref: 157 MC/EC/2020, dated 20.04.2020). The research was a collaborative effort between the Departments of Cardiothoracic and Vascular Surgery and Pharmacology of Sawai Man Singh Medical College and Hospital, Jaipur. Following ethical approval, data were collected over a 12-month period, ensuring full anonymization and confidentiality. A total of 200 patients undergoing CABG were included in the study. Data were collected on demographic characteristics, clinical parameters, and associated comorbid conditions. The variables recorded included age, gender, height, weight, body mass index (BMI), blood pressure, pulse rate, and pre-operative blood glucose levels. In addition, the presence of cardiovascular risk factors such as hypertension, diabetes mellitus, chronic kidney disease, heart failure, and lipid abnormalities was also documented for each patient.

Statistical Analysis: Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS), version 21.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage. The Chi-square test was used to evaluate the association between categorical variables such as gender and the presence of hypertension. Independent sample t-test was applied to compare mean clinical parameters including body mass index, systolic blood pressure, and blood glucose levels between male and female patients. Pearson correlation analysis was conducted to assess the relationship between age and selected clinical variables such as systolic blood pressure and blood glucose levels. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The average age of patients undergoing CABG was 61.8 years, indicating that the procedure is predominantly performed in older individuals. A clear male predominance was observed, with males accounting for 78% of the study population as depicted in [Table 1].

Table 1: Demographic Characteristics of the patients.

Characteristic	Mean ± SD / Frequency (%)
Age (Years)	61.8 ± 10.7
Male	156 (78%)
Female	44 (22%)
Height (cm)	162.4 ± 8.2
Weight (kg)	58.5 ± 12.4
BMI (kg/m²)	22.2 ± 3.1

The mean blood pressure values indicated borderline elevated systolic pressure among some patients. The average preoperative blood glucose level suggested the presence of impaired glucose metabolism in a proportion of individuals [Table 2].

Table 2: Pre-operative clinical parameters of the patients.

Parameter	Mean ± SD
Systolic Blood Pressure	138 ± 14 mmHg
Diastolic Blood Pressure	76 ± 9 mmHg
Pulse Rate	82 ± 12
Random Blood Glucose	150.4 ± 22 mg/dL

Hypertension was the most common comorbidity observed, affecting more than half of the study population. Diabetes mellitus was the second most prevalent risk factor, present in approximately one-third of the patients as shown in [Table 3].

Table 3: Distribution of Major Risk Factors among patients.

Risk Factor	Frequency (%)
Hypertension (HTN)	55% (n = 110)
Diabetes Mellitus (DM)	33.5% (n = 67)
Chronic Kidney Disease (CKD)	13.5% (n = 27)

Heart Failure (HF)	18% (n = 36)
Hypercholesterolemia	24% (n = 48)
Hypertriglyceridemia	21% (n = 42)

Further statistical analysis was conducted to explore possible associations between demographic characteristics and clinical risk factors. The Chi-square test was used to examine the relationship between gender and hypertension, and the results did not show a statistically significant association ($p = 0.08$). Similarly, when independent sample t-tests were performed to compare clinical parameters between male and female patients, no significant differences were observed in BMI, systolic blood pressure, or blood glucose levels ($p > 0.05$).

Correlation analysis using Pearson's test showed a modest but statistically significant positive relationship between age and systolic blood pressure ($r = 0.28$, $p = 0.002$), as well as between age and blood glucose levels ($r = 0.21$, $p = 0.01$). This suggests that as age increases, there is a tendency for both blood pressure and blood glucose levels to rise among patients undergoing CABG.

DISCUSSION

The present study evaluated the demographic characteristics and cardiovascular risk factor burden among patients undergoing CABG. The findings demonstrate that the majority of patients undergoing CABG were older adults with a mean age of 61.8 ± 10.7 years. This observation is consistent with the natural history of coronary artery disease, where the prevalence of atherosclerosis increases with advancing age. Similar findings were reported by Alexander et al., who observed that patients undergoing CABG were predominantly in the sixth decade of life, reflecting the progressive nature of coronary artery disease and the cumulative effect of long-standing cardiovascular risk factors.[4] Our study was consistent with recent Indian data who reported a mean age of 59.7 years in a large Indian CABG registry.[5] Likewise, Shahjehan et al. also emphasized that CAD incidence increases significantly with age due to progressive plaque formation and vascular remodeling.[1]

Similar findings were reported by another study, where the mean age was 61.21 ± 9.74 years in the first period and slightly lower at 58.01 ± 11.14 years in the second period. This consistency suggests that coronary artery disease commonly affects individuals in their early sixties. The relatively lower mean age reported in the later period of the reference study may reflect a gradual shift toward earlier presentation of the disease, possibly due to increasing exposure to risk factors such as unhealthy lifestyle, diabetes, and hypertension.[6]

The 78% male predominance in our study mirrors the findings of Sajja et al.,who analyzed over 13,000 Indian CABG patients and found approximately 86% were male.[7] similar results were reported by other studies.[6] This consistent gender gap in surgical revascularization research in India suggests that men continue to present with advanced coronary anatomy more frequently or earlier than women. Fryar et al. reported that men tend to develop coronary artery disease approximately 7–10 years earlier than women, largely due to hormonal protection in premenopausal females.[8]

The higher prevalence in men may be related to differences in lifestyle factors, metabolic risk profiles, and delayed presentation of cardiovascular symptoms in women.

Hypertension was the most prevalent risk factor in this study, affecting 55% of patients. Chronic hypertension contributes significantly to endothelial injury, vascular inflammation, and accelerated atherosclerosis, thereby increasing the risk of coronary artery disease. These findings are comparable to those reported by Brown et al., who identified hypertension as one of the strongest predictors of CAD development.[2]

In another clinical analysis of CABG patients conducted by Hillis et al., hypertension was present in more than half of the study population, reinforcing its critical role in the progression of coronary artery disease.[9]

This finding is in agreement with previous studies, which have reported an increasing trend in the prevalence of hypertension and diabetes mellitus, along with a slight decline in hypercholesterolemia. The studies conducted in Iran,[6] and the United States,[10] similarly observed a rising burden of hypertension, suggesting a consistent global pattern. The high prevalence of hypertension in our study further reinforces its significance as a key contributor to endothelial dysfunction, vascular inflammation, and accelerated atherosclerosis. These trends may be attributed to modern lifestyle factors such as physical inactivity, increased work-related stress, and unhealthy dietary habits Effective blood pressure control remains a key strategy in preventing cardiovascular complications and delaying the need for surgical revascularization.

Diabetes mellitus was present in 33.5% of patients in the present study, making it the second most common risk factor. Diabetes is well known to accelerate atherosclerosis and contribute to diffuse multivessel coronary disease. A similar prevalence of diabetes among CABG patients was reported by Farkouh et al., who demonstrated that diabetic patients often exhibit more extensive coronary artery involvement and poorer clinical outcomes.[11] This trend has also been observed in earlier studies.[12]

Dyslipidemia was also commonly observed in the present study, with hypercholesterolemia and hypertriglyceridemia present in 24% and 21% of patients respectively. Abnormal lipid levels play a direct role in the formation and progression of atherosclerotic plaques. According to Libby et al.,

elevated low-density lipoprotein cholesterol and triglycerides significantly contribute to plaque formation and instability, which may ultimately lead to coronary artery occlusion requiring surgical intervention.[13]

Similar lipid abnormalities among CABG patients have been documented in several clinical studies evaluating cardiovascular risk profiles.[6,12]

In addition to traditional risk factors, chronic kidney disease and heart failure were observed in 13.5% and 18% of patients respectively in the present study. These comorbid conditions often coexist with advanced coronary artery disease and may significantly influence perioperative risk and postoperative recovery. Scrutinio and Giannuzzi reported that the presence of comorbidities such as renal dysfunction and heart failure significantly affects surgical outcomes and rehabilitation in patients undergoing CABG.[3]

Careful preoperative assessment and multidisciplinary management are therefore essential to improve outcomes in such patients.

Overall, the findings of the present study highlight the substantial burden of traditional cardiovascular risk factors among patients undergoing coronary artery bypass grafting. Early identification and aggressive management of modifiable risk factors such as hypertension, diabetes mellitus, and dyslipidemia remain critical strategies to prevent disease progression, reduce the need for surgical intervention, and improve long-term cardiovascular outcomes.

In the present study, the Chi-square analysis evaluating the association between gender and hypertension did not show a statistically significant relationship. This suggests that although a larger proportion of patients undergoing CABG were male, the occurrence of hypertension was fairly similar in both men and women. Previous studies have also reported that hypertension is highly prevalent among patients with coronary artery disease irrespective of gender. Brown and colleagues highlighted that hypertension remains one of the most important modifiable risk factors contributing to the development and progression of coronary artery disease.[2]

Similarly, when clinical parameters were compared between male and female patients using an independent sample t-test, no significant differences were found in body mass index, systolic blood pressure, or blood glucose levels. These findings indicate that although men formed the majority of the surgical population, the overall clinical and metabolic profile of male and female patients was largely comparable. A similar observation has been reported in large CABG cohorts, where differences between men and women were mainly related to patient numbers rather than the severity of risk factors. Alexander and Smith also noted that many baseline clinical characteristics remain broadly similar between genders in patients undergoing CABG.[4]

The correlation analysis in the present study showed a significant positive relationship between increasing age and both systolic blood pressure and blood glucose levels. This finding is consistent with the widely recognized effect of aging on cardiovascular and metabolic health. As individuals age, structural and functional changes occur in blood vessels, leading to increased arterial stiffness and higher blood pressure. In addition, age-related metabolic changes may contribute to impaired glucose regulation. Previous studies have also demonstrated that the prevalence of hypertension and diabetes increases with advancing age in patients with coronary artery disease.[1]

Overall, the findings of the present study reinforce the strong influence of traditional cardiovascular risk factors among patients requiring coronary artery bypass grafting. Early identification and effective management of modifiable factors such as obesity, hypertension, and impaired glucose metabolism may help slow the progression of coronary artery disease and potentially reduce the need for surgical revascularization.

CONCLUSION

The present study provides an overview of the demographic characteristics, clinical parameters, and cardiovascular risk factor profile of patients undergoing coronary artery bypass grafting. The findings indicate that CABG is predominantly performed in older individuals, with a clear male predominance. Hypertension and diabetes mellitus were the most common comorbid conditions, followed by dyslipidemia, heart failure, and chronic kidney disease, reflecting the substantial burden of cardiovascular risk factors in patients with advanced coronary artery disease. Additional statistical analysis showed that increasing age was significantly associated with higher systolic blood pressure and blood glucose levels. Overall, these findings emphasize the important role of modifiable risk factors in the progression of coronary artery disease and highlight the need for early detection and effective management of these conditions to improve patient outcomes and reduce the overall burden of cardiovascular disease.

Limitations: Some limitations of the present study should be acknowledged. The study was conducted at a single center, which may limit the generalizability of the findings to other populations. In addition, the analysis focused only on baseline clinical characteristics and did not include long-term follow-up to evaluate postoperative outcomes after CABG. The sample size was also relatively modest. Furthermore, certain lifestyle-related risk factors such as smoking status, diet, and physical activity were not assessed. Future studies with larger sample sizes, multicenter participation, and long-term follow-up would provide a more comprehensive understanding of risk factors and their impact on

outcomes in patients undergoing coronary artery bypass grafting.

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