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ORIGINAL ARTICLE

In Hospital Outcomes of Coronary Artery Bypass Grafting: A Gender Based Comparative Cross Sectional Study

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ABSTRACT

Objective: The objective of this study was to compare the in hospital outcome of coronary artery bypass grafting in male versus female.

Methodology: The cross sectional comparative study was conducted in a tertiary care setting. Using non probability sampling a calculated sample of 100 patients (50 males and 50 females) undergoing CABG were enrolled. After getting their informed consent, preoperative, intraoperative and postoperative variables were entered in the predesigned performa and the patients were observed for the difference in mortality and morbidity in both groups during hospital stay.

Results: In this study 50 male and 50 females were enrolled with mean age of 54.21±8.03 years. Pulmonary complications were the most common (14%) following postoperative wound infection (12%), atrial fibrillation (10%), low cardiac output syndrome (5%), renal failure (4%), neurologic complications (4%), postoperative MI (4%) and stroke (1%). No complication other than postoperative wound infection was found statistically significant.

Conclusion: Through this study we found no significant difference in in-hospital outcome. Only post-operative infection was significantly higher in female cases than male. Hence, the perception regarding in hospital outcome doesn't relate to gender in current study.

Keywords: Coronary Artery Bypass Grafting, In-hospital outcomes, Wound infection

INTRODUCTION

Atherosclerosis in the coronary arteries is the most common and largest threat to both men and women throughout the world. This phenomenon is the main pathological entity for coronary artery disease (CAD) that mainly causes disease process in the walls of coronary arteries resulting in narrowing of their lumens. (Chou et al, 2015). CAD usually manifests clinically in middle to late adulthood.[1]Traditionally men are more prone to have significant coronary artery disease even in early ages. Women usually present with CAD in about 8 to 10 year later ages as compare to men. CAD is the leading cause of death in women even in the prevalence of uterine and breast diseases. Women that developacute myocardial infarction have quite high mortality.[2]Therefore, the risks regarding CABG in women still need some elaboration that how women have worse outcome post CABG as compare to men . The main focus in this regard is the recovery period post coronary artery bypass grafting. The knowledge about postoperative complications and the risk factors in women that can lead to worse outcomes is very important for selection of mode of procedure and decrease recovery period with minimum complications. We have very little data about the individual experiences in men and women during recovery period and whether the experiences differ or not. Gender based differences in the clinical presentations and therapeutic options of cardiovascular diseases have been demonstrated all over the world.This study is adopted to evaluate in hospital complications in patients undergoing CABG with respect gender. By appreciating the importance of these factors, we can foresee the outcomes of coronary artery bypass grafting in both gender of population.

OPERATIONAL DEFINITION

a. Post-operative infection: Wound infection was assessed according to Southampton wound grading system

b. New onset of **AF postoperative** was defined as before the QRS complex together with irregularventricularrhythmontherhythmstripsbythedocumentationof AFrhythmwith≥5minduration within 96 hr at postoperative period on the basis of 12-lead ECGabsent P wave.

c. AKI (Acute kidney injury):after surgery serum creatinine level ≥ 2.0 mg/dL

d. Postoperative M.I: was defined as the presence of new Q waves> 0.04 ms and / or a fall in R waves> 25% in at least 2 connected leads in the electrocardiogram and an increase in CPK-MB% ≥ 10%)

e. Low cardiac output: was defined as patients having requirement of IABP and or inotropic support for more than 30min in ICU to maintain SB.P >90mmHg & C.I >2.2 l/min/m

f. Postoperative Stroke: evidence of new neurological deficit with morphological substrate confirmed by computed tomography.

g. Neurological complications: included events of neurological like coma, focal stroke and encephalopathy and deficits of neurocognitive.

h. Pulmonary Complications: include post-op pleural effusion, pneumonia, ARDS or pneumothorax.

i. Mortality: Any death that occurs within hospital.

MATERIAL AND METHODS

Design & Setting: This cross sectional comparative study was conducted at a Tertiary Care facility of Cardiology.

Sampling Technique: Using non probability purposive sampling a calculated sample of 100 patients undergoing CABG electively of both genders (50 in each group) with age 30-70 years were enrolled. The sample size was computed according to the precision formula, where the study achievement is 99% and the significance level is 5%. P1=32.2% (Population proportion of early outcome in term of mortality (1.4%) and morbidity (30.8%) in male patients undergoing coronary artery bypass grafting group) P2=73.2% (Population proportion of early outcome in term of mortality (4.3%) and morbidity (68.9%) in women patients undergoing coronary artery bypass grafting group).[14]

Patients of undergoing open heart surgery having IHD with concurrent valvular heart disease or any congenital heart defect. Patients with complication such as renal dysfunction, neurological deficit or chronic obstructive pulmonary disease and/or history of any previous cardiac surgery were excluded

Methodology: The study included patients who underwent CABG. The purpose of the study was described to the patient and consent was obtained. A questionnaire was used for datacollection as a study tool. Postoperative variables such as AF, prolonged ventilatory support, acute MI, renal failure, low cardiac output condition, neurological complications, wound infection, postoperative stroke, pulmonary complications, and mortality were expressed as frequency and percentages.

Statistical Analysis: All data were entered and analyzed using SPSS version 20.0. Qualitative variables such as sex, risk factors,

that is (hypertension, smoking, diabetes mellitus, history of ischemic heart disease, hyperlipidemia, evaluation of the coronary angiogram for target vessels (LMS, LAD, LCxand RCA), early results postoperative results i.e postoperative atrial fibrillation, acute MI, renal failure, neurological complications, wound infection, postoperative stroke and mortality were expressed as frequency and %age. Quantitative variables such as age, height, weight, BSA, preoperative EF%, total number of blood bags used, The number of target vessels and grafts applied during surgery was reported as mean±SD. The chi-square test was used to regulate the link between the qualitative variables with both groups while the cell frequency is <5, then a specific test for fishermen was applied .Anindependentsamplet-testwas applied to quantitative variables. The value of P ≤ 0.05 was considered significant.

RESULTS

In this study 100 cases were taken with 50 male and 50 female so the mean age of male was 54.10±8.25 years and female cases was 54.32±7.89 years.

Table 01: Baseline Characteristics with respect to Gender

	Male (n=50)	Female (n=50)
Age group		
35-45 years	07(14%)	05(10%)
46-60 years	29(58%)	34(68%)
61-75 years	14(28%)	11(22%)
BMI		
Overweight	23(46%)	16(36%)
Obese	27(54%)	32(62%)
Ejection Fraction	49.1±8.74%	48.8±10.5%
No. of Grafts	2.82±0.92	2.74±0.72

The minimum and maximum ages on male and female cases were 39-69 and 38–69 respectively. There were 23(46%) male and 18(36%) female cases that were overweight while with respect to obesity 27(54%) males and 32(64%) females were recorded. In male and female cases the mean EF (%) was 49.11±8.74% and 48.85±10.58% respectively. The mean total number grafts were 2.82±0.92 in male cases and 2.74±0.72 in female. In male, 6(12%) and among female 4(8%) cases had post operative AF, with statistically insignificant difference. Only 1(2%) male case was reported with post operative stroke. Among male and female cases there were 3(6%) and 1(2%) subjects who had renal failure respectively, with statistically insignificant difference similarly there was only 01 male and 03 female cases who had postop MI, with statistically insignificant difference. There were 5(10%) and 9(18%) pulmonary complications in male and female respectively with no statistical difference. In male and female cases 1(2%) and 4(8%) had low cardiac output state respectively with statistically insignificant difference. There were 1(2%) male and 3(6%) female cases who had neurological complications with statistically insignificant difference.

Table 2: Association of in hospital outcomes with Gender

	Male n(%)	Female n(%)	p-value
Post-operative AF	06 (12%)	04 (18%)	0.50
Post-operative stroke	01(2%)	00(0%)	0.31
Renal Failure	03(6%)	01(2%)	0.31
Post-operative MI	01(2%)	03(6%)	0.31
Pulmonary complications	05(10%)	09(18%)	0.25
Low cardiac output state	01(2%)	04(8%)	0.17
Neurological complication	01(2%)	03(6%)	0.30
Post-operative Infection	03(6%)	09(18%)	0.03*
Mortality	01(2%)	02(4%)	0.50
*p-value < 0.05 (significant)			

There were 3(6%) male and 9(18%) cases who had post-operative infection with a statistically higher infection rate in female cases as p-value was 0.037 (<0.05). All infections were of type II or III as per Southampton wound grading. In this study only 1(2%) male and 2(4%) femaledied

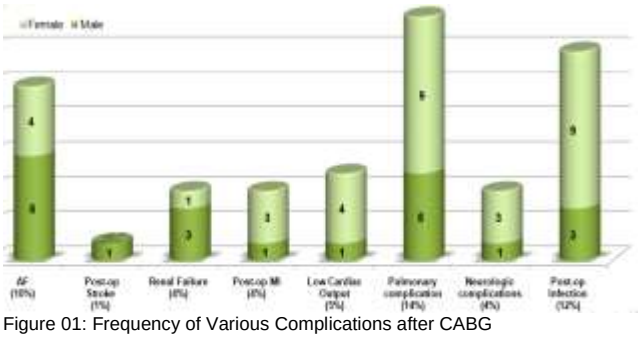

Figure 01: Frequency of Various Complications after CABG

DISCUSSION

The impact of female gender on clinical outcomes after isolated coronary artery bypass grafting (CABG) has been reported in several studies, with controversial and not definitive results [15]. Post-operative outcomes in women undergoing isolated CABG have been intensively studied, due to higher post-operative mortality and morbidity observed in this group of patients [16]. However, other studies have shown no difference between male and female patients [17].

Female gender has been clearly reported as an independent predictor of poor post-operative outcomes including mortality after CABG only in a few studies.[18] Moreover, the evidence for the impact of gender in patients who underwent isolated surgical revascularization procedures derives primarily from observational studies based on retrospective registries, predominantly single center series.[19]

Only few studies investigated a relatively large study population and, with the exception of a few, most of these studies reported only perioperative or intermediate follow-up outcomes. Finally, another limitation of the previous literature is that it frequently evaluated only the mortality as primary endpoint.[20] There has been less research into long-term differences of other morbidity endpoints and nonfatal events between males and females after isolated CABG.[21] Examination of factors that may contribute to gender disparities among Surgical outcomes for this specific procedure have been intensely studied, categorized, and documented. As a result, a number of trends have been documented over the past several years. For example, a review of early coronary revascularization studies shows that fewer numbers of women underwent CABG; typically <30% of bypass patients were women.[22]

The risk profiles of men and women who undergo CABG vary widely. Furthermore, a given risk factor can have variable impact on outcomes between these two groups. Although definitive conclusions regarding causation, risk factors, and modifiable predictors have not been completely clarified by available data, a number of evidence-based differences have been described. Female sex has generally been accepted as an independent predictor of early mortality in the perioperative period.[23] In fact, many studies have shown this increased perioperative mortality to be on the order of 2–3% higher.[15]A study was done to investigate the gender disparity in the distribution of patient-related risk factors and their effect on the surgical management and clinical outcome of coronary artery disease in Saudi population. The author carried out a retrospective analysis of prospectively collected data of patients undergoing isolated coronary artery bypass grafting (CABG). The result has showed that mean age was 59.5 years in males and 63.4 years in females (p = < 0.0003). Females required urgent surgery and less than 3 grafts more frequently while males underwent elective surgery and more than 3 grafts in greater numbers. No significant difference was present between the two gender groups in aortic occlusion times and bypass times. [14]. In

current study the mean age of male cases was 54.10 ± 8.25 years and female cases was 54.32 ± 7.89 years. The mean total number grafts were 2.82 ± 0.92 in male cases and 2.74 ± 0.72 in female, p-value = 0.630. Another study reported that males received significantly more bypass grafts (3.0± 1.0 vs 2.8±1.0, p=0.001).[24]In current study the mean total number grafts were 2.82±0.92 in male cases and 2.74± 0.72 in female, p-value = 0.630.

It is a generally said that females experienced significantly higher rate of myocardial infarction, and not significantly higher occurrence of heart failure, and need for long-term care. Males experienced significantly higher rate of cumulative re-hospitalization. Female gender was not an independent predictor of death at long-term follow-up. Prevention of new occurrence of postoperative myocardial infarction and enhancement of complete coronary revascularization should be future endpoints.[24] In current study we found statistically same in hospital outcome in both male and female cases but infection was higher in female cases.

However, in-hospital mortality decreased at a faster rate in women (3.8% to 2.7%, RR -29.1%, ptrend 0.002) than in men (2.2% to 1.6%, RR -25.7%, ptrend<0.001) from 2003 to 2012. [25]. In current study in this study 1(2%) male and 2(4%) females were died. In-hospital death rate was 1.8% (n=2,297), and women had a significantly higher risk of death: 2.5% vs. 1.6% in men.[26] Mortality in women was 6.0% as compare to men 2.0%[27] In another study it was reported that thirty days mortality in women was 4.3% as compare to men 1.4%, while morbidity was found to be 30.8% in male and 68.9% in females.[14] Another study reported that In-hospital mortality rates were not influenced by sex, as there was no difference found between the two groups (2.5% women vs. 2.2% men; P > 0.05) [28].

Further study by Ahmad et al (2010) females gender as an independent risk factor for higher in-hospital mortality (1.1% versus 4.9% p = 0.0026). One more study reported Female gender was independently associated with higher 30-day mortality (4.8% vs 0.8%).[29]These statistics are almost similar to our findings but a study reported higher mortality rate i.e. thirty day mortality in women was 6.9% as compare to men 4.6%. [30]

CONCLUSION

Through this study we found no significant difference in in-hospital outcome like post operative stroke, post operative AF, renal failure, post operative MI, low cardiac output state, pulmonary complications and mortality. Only post operative infection was significantly higher in female cases than male. Hence, the perception regarding in hospital outcome doesn't relate to gender in current study.

REFERENCES

1. Samady H, Eshtehardi P, McDaniel MC, Suo J, Dhawan SS, Maynard C, et al. Coronary artery wall shear stress is associated with progression and transformation of atherosclerotic plaque and arterial remodeling in patients with coronary artery disease. Circulation. 2011;124(7):779-88.
2. Mosca L, Benjamin EJ, Berra K, Bezanson JL, Dolor RJ, Lloyd-Jones DM, et al. Effectiveness-based guidelines for the prevention of cardiovascular disease in women—2011 update: a guideline from the American Heart Association. J Am Coll Cardiol. 2011;57(12):1404-23.
3. ElBardissi AW, Aranki SF, Sheng S, O'Brien SM, Greenberg CC, Gammie JS. Trends in isolated coronary artery bypass grafting: an analysis of the Society of Thoracic Surgeons adult cardiac surgery database. J Thorac Cardiovasc Surg. 2012;143(2):273-81.
4. Hlatky MA, Boothroyd DB, Reitz BA, Shilane DA, Baker LC, Go AS. Adoption and effectiveness of internal mammary artery grafting in coronary artery bypass surgery among medicare beneficiaries. J Am Coll Cardiol. 2014;63(1):33-9.
5. Allen K, Cheng D, Cohn W, Connolly M, Edgerton J, Falk V, et al. Endoscopic vascular harvest in coronary artery bypass grafting surgery: a consensus statement of the International Society of Minimally Invasive Cardiothoracic Surgery (ISMICS) 2005. Innovations. 2005;1(2):51-60.
6. Kelly R, Buth KJ, Légaré J-F. Bilateral internal thoracic artery grafting is superior to other forms of multiple arterial grafting in providing survival benefit after coronary bypass surgery. J Thorac Cardiovasc Surg. 2012;144(6):1408-15.
7. Alexander JH, Smith PK. Coronary-artery bypass grafting. N Engl J Med. 2016;374(20):1954-64.
8. Edwards FH, Ferraris VA, Shahian DM, Peterson E, Furnary AP, Haan CK, et al. Gender-specific practice guidelines for coronary artery bypass surgery: perioperative management. Ann Thorac Surg. 2005;79(6):2189-94.
9. Abramov D, Tamariz MG, Sever JY, Christakis GT, Bhatnagar G, Heenan AL, et al. The influence of gender on the outcome of coronary artery bypass surgery. Ann Thorac Surg. 2000;70(3):800-5.
10. Guru V, Fremes SE, Austin PC, Blackstone EH, Tu JV. Gender differences in outcomes after hospital discharge from coronary artery bypass grafting. Circulation. 2006;113(4):507-16.
11. Toumpoulis IK, Anagnostopoulos CE, Balaram SK, Rokkas CK, Swistel DG, Ashton Jr RC, et al. Assessment of independent predictors for long-term mortality between women and men after coronary artery bypass grafting: are women different from men? J Thorac Cardiovasc Surg. 2006;131(2):343-51.
12. Edwards FH, Carey JS, Grover FL, Bero JW, Hartz RS. Impact of gender on coronary bypass operative mortality. Ann Thorac Surg. 1998;66(1):125-31.
13. Blasberg JD, Schwartz GS, Balaram SK. The role of gender in coronary surgery. Eur J Cardiothorac Surg. 2011;40(3):715-21.
14. Ahmad M, Arifi AA, van Onselen R, Alkodami AA, Zaibag M, Khaldi AAA, et al. Gender differences in the surgical management and early clinical outcome of coronary artery disease: Single centre experience. J Saudi Heart Assoc. 2010;22(2):47-53.
15. Koch CG, Khandwala F, Nussmeier N, Blackstone EH. Gender and outcomes after coronary artery bypass grafting: a propensity-matched comparison. J Thorac Cardiovasc Surg. 2003;126(6):2032-43.
16. Ried M, Lunz D, Kobuch R, Rupprecht L, Keyser A, Hilker M, et al. Gender's impact on outcome in coronary surgery with minimized extracorporeal circulation. Clin Res Cardiol. 2012;101(6):437-44.
17. Al-Alao BS, Parissis H, McGovern E, Tolan M, Young VK. Gender influence in isolated coronary artery bypass graft surgery: a propensity match score analysis of early outcomes. Gen Thorac Cardiovasc Surg. 2012;60(7):417-24.
18. Bukkapatnam RN, Yeo KK, Li Z, Amsterdam EA. Operative mortality in women and men undergoing coronary artery bypass grafting (from the California Coronary Artery Bypass Grafting Outcomes Reporting Program). Am J Cardiol. 2010;105(3):339-42.
19. Hassan A, Chiasson M, Buth K, Hirsch G. Women have worse long-term outcomes after coronary artery bypass grafting than men. Can J Cardiol. 2005;21(9):757-62.
20. Ennker IC, Albert A, Pietrowski D, Bauer K, Ennker J, Florath I. Impact of gender on outcome after coronary artery bypass surgery. Asian Cardiovasc Thorac Ann. 2009;17(3):253-8.
21. Puskas JD, Kilgo PD, Lattouf OM, Thourani VH, Cooper WA, Vassiliades TA, et al. Off-pump coronary bypass provides reduced mortality and morbidity and equivalent 10-year survival. Ann Thorac Surg. 2008;86(4):1139-46.
22. Humphries KH, Gao M, Pu A, Lichtenstein S, Thompson CR. Significant improvement in short-term mortality in women undergoing coronary artery bypass surgery (1991 to 2004). J Am Coll Cardiol. 2007;49(14):1552-8.
23. Mandegar MH, Marzban M, Lebaschi AH, Ghaboussi P, Alamooti AR, Ardalan A. Gender influence on hospital mortality after coronary artery bypass surgery. Asian Cardiovasc Thorac Ann. 2008;16(3):231-5.
24. Nicolini F, Vezzani A, Fortuna D, Contini GA, Pacini D, Gabbieri D, et al. Gender differences in outcomes following isolated coronary artery bypass grafting: long-term results. J Cardiothorac Surg. 2016;11(1):144.
25. Swaminathan RV, Feldman DN, Pashun RA, Patil RK, Shah T, Geleris JD, et al. Gender differences in in-hospital outcomes after coronary artery bypass grafting. Am J Cardiol. 2016;118(3):362-8.
26. Lempereur M, Magne J, Cornelis K, Hanet C, Taeymans Y, Vrolix M, et al. Impact of gender difference in hospital outcomes following percutaneous coronary intervention. Results of the Belgian Working Group on Interventional Cardiology (BWGIC) registry. EuroIntervention. 2014;12(2):216-23.
27. Kasirajan V, Wolfe LG, Medina A. Adverse influence of female gender on outcomes after coronary bypass surgery: a propensity matched analysis. Inter Cardiovas Thora Surg. 2009;8(4):408-11.
28. Yazdanian F, Azarfarin R, Aghdaii N, Motlagh SJ, Faritous Z, Alavi M, et al. Relationship between gender and in-hospital morbidity and mortality after coronary artery bypass grafting surgery in an Iranian population. Res Cardiovasc Med. 2012;1(1):17.
29. Woods SE, Noble G, Smith JM, Hasselfeld K. The influence of gender in patients undergoing coronary artery bypass graft surgery: an eight-year prospective hospitalized cohort study. J Am Coll Surg. 2003;196(3):428-34.
30. Eifert S, Kilian E, Beiras-Fernandez A, Juchem G, Reichart B, Lamm P. Early and mid term mortality after coronary artery bypass grafting in women depends on the surgical protocol: retrospective analysis of 3441 on-and off-pump coronary artery bypass grafting procedures. J Cardioth Surg. 2010;5(1):90-5.