RESEARCH ARTICLE

PHYSICAL OUTCOME AND ITS DETERMINANTS OF PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFT (CABG) AND VALVULAR SURGERIES IN JIPMER, PUDUCHERRY

1,*Aruna P., 2Dr. Lakshmi Ramamoorthy and 3Dr. Durga Prasad Rath

1M.Sc nursing, Tutor, JIPMER, Puducherry, India
2Assistant Professor, Phd, JIPMER, Puducherry, India
3Associate Professor, JIPMER, Puducherry, India

ARTICLE INFO	ABSTRACT
	Introduction: Cardiovascular diseases (CVDs) have become the most important cause of non - communicable disease deaths.According to WHO statistics, cardiovascular diseases are the most common cause of deaths in the world.In every open heart surgery, there is the risk of complications specific to the disease and surgery being performed, in addition to the general risks related to surgery and anesthesia. Both CABG & valvular surgeries are performed to improve functional capability and quality of life. **Aim:** To assess the physical outcome and its determinants of patients undergoing Coronary artery bypass graft and valvular surgeries. **Methods:** In this prospective observational study, 40 patients who underwent coronary artery bypass graft or valvular surgery were selected through consecutive sampling method from August 2018 to February 2018. The tools used for data collection were numerical rating scale to assess postoperative pain, performance check list for using incentive spirometry and subject data sheet. **Results:** The complications observed in CABG group were bleeding 2 (11.8%) and re-exploration 1 (5.9%), cognitive impairment 2 (11.8%) and graft site infection 1 (2.5%). Major complications observed in valve group were bleeding 3 (13%) and re-exploration 2 (8.7%), atrial fibrillation (52.2%), acute kidney injury 1 (4.3%), pericardial effusion 1 (4.3%). There was an improvement in NYHA functional class postoperatively where 88.5% of participants were in NYHA grade I. The determinants of outcome of CABG surgery were age more than 65 years ($p < 0.017$), NYHA grade II & III ($p < 0.052$), triple vessel disease ($p<0.033$), and high BMI ($p<0.46$). The determinants of outcome after valve surgery include female gender (0.008), NYHA grade III & IV ($p < 0.026$), mitral valve replacement ($p<0.054$), and history of previous cardiac operation ($p<0.001$). **Conclusion:** Coronary artery bypass graft and valve surgeries improve the quality of life in patients with coronary artery disease and valvular heart disease.

INTRODUCTION

Cardiovascular diseases (CVDs) have become the most important cause of non-communicable disease deaths. According to WHO statistics, cardiovascular diseases are the most common cause of deaths in the world. In 2015, 17.7 million deaths were due to CVDs, representing 31% of all deaths in the world. Of these deaths, approximately 7.4 million deaths were from ischemic heart disease. According to Global Burden of Disease Report, the age-standardized mortality rate in India is 272 per 100000 population which is higher than the global average rate of 235 per 100000.

Corresponding author: **Aruna P.,**
M.Sc nursing, Tutor, JIPMER, Puducherry, India.

Next, to ischaemic heart disease (IHD), valvular heart diseases emerged as a common heart disease in clinical practices, and cause increased morbidity and mortality.Around 2% of deaths attributable to cardiovascular diseases is due to rheumatic heart disease. In every open heart surgery, there is the risk of complications specific to the disease and surgery being performed, in addition to the general risks related to surgery and anesthesia. Even for the same disease the demographic factors, time of presentation, associated other medical conditions etc also are important factors affecting the outcome.

Background: Coronary artery disease and valvular heart disease are common among cardiovascular diseases and the burden of CAD and valvular heart disease is enormous, for the patients as well as for the country. Both CABG &valvular

surgery are performed to improve functional capability and quality of life. A limited amount of information is available regarding the various factors that are associated with achieving these goals. Since the huge number of people undergo CABG & valvular surgeries globally and healthcare expenditures related to these interventions is high, both clients and healthcare providers need to have realistic anticipations about the course of recovery and to identify deviancies from the normal recovery pattern. Since RHD affects predominantly the younger population in their productive years, it has an enormous socio-economic impact on the society. So the better postoperative outcome helps them to lead a productive life. This study will help in identifying predictors of outcome after cardiac surgeries. By managing the factors affecting the outcome of CABG and valvular surgeries, the morbidity and mortality can be reduced. This study can help the nurses to provide a comprehensive care to the patients undergoing CABG and valvular surgeries. The conceptual framework adopted for the present study was Betty Neuman's System Model. This model emphasizes the individual's relationship to stressors, the reaction to it and levels of intervention.

Statement of the problem

A prospective observational study to assess the physical outcome and its determinants of patients undergoing coronary artery bypass graft (CABG) and valvular surgeries in JIPMER, puducherry.

Objectives

- To assess the Physical outcome and its determinants of patients undergoing Coronary Artery Bypass Graft (CABG) and valvular surgeries and to associate the physical outcome with socio-demographic and clinical variables of the patients undergoing CABG &valvular surgeries.

Research Question

- Do the patients undergoing CABG &Valvular surgeries have normal recovery pattern?

METHODOLOGY

Prospective observational design

Participants: The consecutive sample of patients who underwent coronary artery bypass and valvular surgery was recruited. The inclusion criteria were Patients with cardiac problems who underwent CABG and valvular surgeries in JIPMER hospital, Puducherry and patients with an adequate level of comprehension, attention, and intelligence, aged more than 18 years. The exclusion criteria were patients who were critically ill in preoperative stage and having significant visual or hearing impairments, patients with the known history of psychiatric disorders. The sample size is estimated to be 25 CABG and 25 valvular patients based on previous study with 50% of patients developed complication with 20% relative precision and 5% level of significant.

Data collection: Data were collected using subject data sheet, performance check list, and pain numerical rating scale. Feasibility of the study was assessed by conducting a pilot study.

Approximately 10% of the sample size (5 patients) were included in the study. Data collected between August 2017 to February 2018.

Ethical considerations: Approval for carrying out this study was obtained from Nursing research monitoring committee and Institute Ethics Committee, Human studies.

Data analysis: Demographic variables and clinical variables were analyzed with frequency & percentage, mean with standard deviation, median with interquartile range.

Validity, reliability: The validity of the tool was established by subject experts, department of CTVS and Department of Medical-Surgical Nursing.

RESULTS

Demographic variables of patients underwent CABG & valvular surgeries: Majority of the subjects belonged to the age group of 45-59 years (47.1%) in CABG group. the majority of the subjects belonged to the age group of 45 – 59 years (47.8%) in valve group. The majority of the study subjects were Males, 15 (88.2%) in CABG group. The number of Male and Female participants in valve group were 10 (43%) and 13 (57%), respectively. Majority of subjects, 13 (76.5 %) in CABG group and 8 (34.8 %) in valve group had secondary education. A sum of 27 of them in both the groups were skilled workers and 11 of them were unemployed. Totally 38 of them in both groups were married.

Preoperative clinical parameters of patients underwent CABG & valvular surgeries: 17.6 % (3) of subjects had diabetes mellitus, 2 (11.8 %) had hypertension and 9 (53 %) had both diabetes mellitus and hypertension in CABG group. Only one had (4.3 %) diabetes mellitus in valve group. Among 15 subjects who had comorbidities in both groups, 13 were taking treatment regularly. Majority of subjects in CABG group were found to be in NYHA II, 7 (41.2%) & NYHA III, 7 (41.2 %) and 14 (60.8 %) were found to be in NYHA III among patients underwent valve surgery. The majority of the participants' preoperative ejection fraction was more than 45%. Out of 23 participants in valve group, 11 (47.8 %) found to have preoperative atrial fibrillation. Nearly half of the participants in valve group had a history of previous cardiac operation. The number of participants with high BMI was more in CABG group. Five (29.4 %) in CABG group and 4 (17.4 %) in valve group were smokers and 9 (52.9 %) in CABG group and 2 (8.7 %) in valve group were alcoholics. A total of 37 participants were non-vegetarians. Among 17 patients with coronary artery disease, one had left atrial myxoma and one had valvular heart disease. Duration of present illness was less than one year in the majority of subjects and on regular treatment. Increased frequency of triple vessel disease was observed. Only 23.5% of participants had a family history of CAD among patients underwent CABG. The frequency of the previous history of MI and USA, CSA were 13(76.4%), 2(11.8%) and 2(11.8%) respectively. On pump CABG was performed commonly, 15 (88.2%) and 2 (11.8%) had off-pump CABG. 1 (5.9%) had left atrial myxoma excision along with CABG. And one participant had both CABG and valve replacement. Common cause of valvular heart disease was RHD. The commonly affected valve was the mitral valve. Increased frequency of surgery on the single valve, 13 (56.52%) was noted, followed by the double valve, 9

(39.13%) and triple valve, 1 (4.3%). A total of 12 (52.2%) participants underwent MVR, 6 (26%) of participants had AVR and 5 (21.7%) participants had double valve replacement (DVR).

Postoperative pain level: Majority of subjects in both groups had mild to moderate level of pain on the 3rd postoperative day. On the 7th postoperative day, 47.8% of subjects in valve group had mild pain and 47.1% of subjects in CABG group had moderate pain.

Postoperative clinical parameters: Length of postoperative hospital stay was longer in valve group than CABG group (p = 0.020). The rationale for this difference is to stabilize INR before discharge as most of the patients are from the poor socioeconomic background and come from far off places. Three out of five subjects who had bleeding in both groups were re-explored to control bleeding. And three subjects among both groups had IABP management.

Adherence to drug regime, lifestyle modification, and postoperative NYHA functional classification: All subjects had good adherence to cardiac diet and smoking cessation. 36 out of 40 participants are highly adherent to drug regime. Most of the participants had improvement in NYHA classification after discharge.

Determinants of postoperative outcome: In CABG group, increased complication frequency was observed in people aged more than 65 years (p < 0.017), subjects with triple vessel disease (p<0.033), NYHA grade II & III (p < 0.052), high BMI (p<0.46). Clinical significance could not be derived from other parameters including preoperative EF, gender as subjects in this group were not homogeneous. In valve group, increased complication frequency in female gender (p<0.008), subjects with NYHA grade III & IV (p < 0.026), nature of valve operated (p<0.054), history of previous cardiac operation (p<0.001) was observed. Clinical significance could not be derived from other parameters including preoperative EF & BMI, age as subjects in this group were not homogeneous.

DISCUSSION

Description of the demographic variables: The present study shows that the majority of the subjects belonged to the age group of 45-59 years (47.1%) in CABG group and 30 – 59 years (87%) in valve group. The majority of the study subjects were Males, 15 (88.2%) in CABG group. The majority of subjects, 13 (76.5 %) in CABG group had secondary education and 14 (82.3%) were skilled workers and all were married. A study conducted by Douki et al showed similar results with an average age of participants was (58.27±9.97). Majority of the participants were male (55.6%), married (99.5%), the majority of the patients had less than 5 years of schooling (70.1%), 78 (41.7%) of them were house worker, duration of cardiac illness in most of the participants (68.4%) was (1-5) years. Among valve group in the present study, 10 (43.4%) were male and 13 (56.5%) female. 7 (30.4%) had primary education, 8 (34.8 %) had secondary education, 2 (8.7%) had graduation, 6 (26.1%) with no formal education, 13 (56.5%) skilled workers, 10 (43.5%) unemployed, 91.3% of subjects were married. A study conducted by Namazi et al showed that the majority of subjects was women (60.8%) and men (39.2%) with the average age of 49-59 years, 89.2% were married, 43.1% had primary education and 4.9% were graduate.

Among all participants, 52% was housewives and 56.9 % had no income, while the minimum number of participants (6.9%) had sufficient income.

Clinical parameters: In CABG group, 17.6 % (3) of subjects had diabetes mellitus, 11.8 % (2) had hypertension and 53 % (9) had both diabetes mellitus and hypertension. In valve group, 1 (4.3%) had diabetes mellitus. A study conducted by Douki et al shows most of the patients, 47.05% had hypertension, 37.43% diabetes mellitus. In this study, the majority of participants in CABG group were found to be in NYHA II, 7 (41.2%) & III, 7 (41.2%). Majority of the participants' preoperative ejection fraction was more than 45% and 4 (23.5%) participants had a family history of coronary artery disease. Lie et al conducted a study on predictors of outcome and the results were: mean age of participants was 62, 90% of participants were male, history of previous MI (35%), 46% had a family history of the CAD, mean preoperative EF and NYHA class was 64.4 and 2.7, correspondingly. In this study CABG group, the number of participants with high BMI was 9 (52.9%) and normal weight, 7 (41.2%). A study conducted in Brazil by Costa et al stratified participants based on BMI as healthy weight (32.0%), overweight (47.5%), and obese (20.8%).

In this study, five (29.4 %) in CABG group and 4 (17.4 %) in valve group had a history of smoking and 9 (52.9 %) in CABG group, 2 (8.7 %) in valve group were alcoholics. A total of 37 participants were non-vegetarians. Amongst 17 patients with coronary artery disease, one had left atrial myxoma and one had valvular heart disease. Triple vessel disease was observed in 88.2% of subjects. On pump CABG was performed commonly, 15 (88.2%) and off-pump CABG in 2 (11.8%). The findings of this study in contrast to the results of a study conducted by Adekola et al which showed triple-vessel disease in 39.26% and double-vessel disease in 32.59%. 97.78% of patients underwent on pump CABG. Off-pump CABG surgery was performed in 2.22% patients that is similar to the present study. In the present study, a total of 14 (60.8 %) were found to be in NYHA III among patients underwent valve surgery. Among 23 participants in valve group, 11 (47.8 %) had preoperative atrial fibrillation. 47.8% of the participants in valve group had a history of previous cardiac operation. A study done by Alsoufi et al presented with 94 percent of participants in NYHA class III and IV, and 60% had a history of previous cardiac operations. In this study, rheumatic heart disease was the common cause of valve disease (73.9%) and others were degenerative valve disease (13%), infective endocarditis (8.7%), and 4.3 % valvular heart disease (Aortic Regurgitation due to ventricular septal defect). The commonly affected valve was the mitral valve, predominantly mitral stenosis, due to rheumatic etiology. The commonest cause of isolated aortic stenosis was degenerative calcific valve disease. Most of the participants had involvement of more than one valve. This is similar to the findings of other study carried out by Manjunath et al demonstrated, in RHD, the pattern of involvement of valves was mitral (60.2%), followed by aortic, tricuspid and pulmonary valves. Mitral stenosis was almost absolutely of RHD (97.4%). Degenerative calcification was the common cause of isolated Aortic stenosis (65.0%) followed by the bicuspid aortic valve (33.9%) and rheumatic heart disease (1.1%). More than one valve was affected in (36.8%). This finding was similar to the study carried out by Alsoufi et al showed that most common aortic and mitral valve disease was the rheumatic disease (61%), followed by prosthetic valve

Table 7. Postoperative clinical parameters of patients underwent CABG & valvular surgeries

N = 40

Name of the Variables	CABG group (n =17) Mean ± (SD)	Valve group(n =23) Mean ± (SD)	p-value
Duration of intubation in hours (Median)	21 (13 – 40.50)*	14.50 (13 - 25)*	0.221
Early ambulation (days)	4.00 (1.83)	3.30 (1.32)	0.002*
Length of ICU stay (days)	4.70 (1.75)	4.73 (1.82)	0.095
Length of postoperative hospital stay (days)	13.00 (3.93)	15.13 (5.88)	0.020*
Using incentive spirometry	17 (100%)	23 (100%)	-

Table 8 . Assessment of Postoperative complication among patients underwent CABG & valve surgeries

N = 40

Name of the Variables	CABG (n = 17)	Valve surgery (n = 23)
	Frequency (%)	Frequency (%)
Bleeding	2 (11.8)	3 (13.0)
Atrial fibrillation	-	12 (52.2)
Acute kidney injury	-	1 (4.3)
Pericardial effusion	-	1 (4.3)
Cognitive impairment	2 (11.8)	-
Graft site infection	1 (5.9)	-
Low cardiac output	1 (5.9)	-

dysfunction (22%). The present study showed an increased frequency of surgery on the single valve, 13 (56.52%) was noted, followed by the double valve, 9 (39.13%) and triple valve, 1 (4.3%). A total of 12 (52.2%) participants underwent MVR, 6 (26%) of participants had AVR and 5 (21.7%) participants had double valve replacement (DVR). This is similar to results of the study conducted by Mangnall et al which showed the majority of participants were female (63.5%), most of the participants underwent mitral valve replacement (52%) followed by multiple valve replacement (29%) and aortic valve replacement. The cause of the majority of valve replacement surgery (52%) was mitral valve disease.

Physical outcome

Duration of mechanical ventilation, ICU stay, and postoperative hospital stay: The current study shows that mean duration of stay in intensive care unit among CABG group was 4.70 ±1.75 days and 4.73 ±1.82 days in valve group. The median value of the duration of intubation was 21 hours in CABG group and 14.50 hours in valve group. This is similar to the findings of the study conducted by Sattari et al in which the mean length of ICU stay and duration of intubation was 4.78 days and 17.38 hours, respectively. Another study was done by Flegler and Paro showed the mean days of ICU stay 5.17 ± 8.42 days and mean intubation time of 10.99 ±8.41 hours. Another study conducted by Osinaike et al shows that mean duration of ICU stay was 3.96 ± 1.60 days. The findings of the study conducted by Azarfarin et al showed 65.7% had ICU stay ≤ 96 hours and 34.3% had ICU stay > 96 hours. The mean duration of postoperative hospital stay in the present study was 13 ± 3.93 days. The results of a study conducted by Torabipour et al reveals that the mean duration of the hospital stay after CABG was 11.7 days and numerous factors were associated with length of stay after CABG. Another study of Pato et al showed prolonged hospitalization in RHD with a median of 15 days as that of 10 days in the non-rheumatic participants (p< 0.002).

Postoperative pain: The present study reveals that 6 (35.3%) of subjects reported mild pain, 5 (29.4%) had moderate pain and 3 (17.6%) had severe pain in CABG group on the 3rd postoperative day. Mild pain was reported by 7 (41.2%) of participants and moderate pain, 8 (47.1%) on the 7th postoperative day of CABG.

Among valve group, the severity of pain was reported as mild, 6(26.1%); moderate, 7 (30.4%), severe, 6 (26.1%) on the 3rd postoperative day. Majority of participants reported mild pain on the 7th postoperative day. There was no significant association between pain level and age, gender, educational status. A study conducted by Totonchi et al shows that subjects had mild to moderate level of pain on 3rd and 7th postoperative day and severity of pain began to reduce from the 3rd postoperative day. Another study conducted by Mello et al showed, 25% of subjects had a mean pain score of 1.98 on the third postoperative day and 15% of subjects had a mean pain score of 0.98 on sixth postoperative day.

Postoperative complication: In the current study, commonly observed complications in CABG group were bleeding (11.8%), cognitive impairment (11.8%) and one subject were readmitted for graft site infection. The complications observed were more in people aged more than 60 years (p < 0.017), with triple vessel disease (p<0.033), NYHA grade II & III (p < 0.052), and high BMI (p<0.046).

Clinical significance could not be derived from other parameters including preoperative EF and gender as subjects in this group were not homogeneous. In valve group, the principal postoperative complication was atrial fibrillation, 12 (52.2%) which was also present preoperatively. Other complications observed were bleeding in 3 (13%), AKI in 1 (4.3%), pericardial effusion in 1 (4.3%). The increased complication frequency observed in female gender (p<0.008), subjects with NYHA grade III & IV (p <0.026), patients with history of previous cardiac operation. Clinical significance could not be derived from other parameters including preoperative EF & BMI, age, nature of valve operated as subjects in this group were not homogeneous. A study conducted by Adekola et al shows that most frequent complications were significant pleural effusion, followed by deep sternal wound infection and respiratory failure. Thirty days' perioperative mortality occurred in 17 patients (5.84%). In this current study also, pleural effusion was observed in 15% of participants, but sternal wound infection and respiratory failure were not present. Another study conducted by Guzman & Perez reveals that perioperative myocardial infarction (2%), re-exploration (1.5%), stroke (1%), pulmonary embolism (1%).

In this present study 3 (7.5%) were re-explored to control bleeding. The complications like myocardial infarction, pulmonary embolism, and stroke were not reported. In both groups majority of participants were in NYHA functional class II and III preoperatively. There was an improvement in NYHA functional class postoperatively where 88.5% of participants were in NYHA grade I.

Determinants of outcome: In this study, the determinants of poor outcome of CABG surgery are, age more than 60 years (p < 0.017), NYHA classification II & III (p < 0.052), triple vessel disease (p<0.033) and high BMI (p<0.46). Nicolini et al conducted a study which showed that patients aged < 60 who experienced CABG had a lesser threat of adverse outcomes than old age people. In the present study also, the younger population had no complications. Based on the findings of the present study, the determinants of poor outcome after valve surgery include female gender (0.008), NYHA grade III & IV (p < 0.026), mitral valve replacement (p<0.054), history of previous cardiac operation (p<0.001). In the current study, the complications were common in the female gender, (p<0.008). This is similar to findings of a study done by Borrego et al which showed females more often had the complication than males but, female gender was not an independent risk factor for outcome. Another study carried out indicated the risk factors associated with mortality were duration of cardiopulmonary bypass, dialysis, managing patients with IABP, neurologic dysfunction, serum creatinine level on admission > 0.4mg/dL, time from hospital admission to surgical procedure, and age > 65 years. Since the group was not homogenous and intraoperative variables were not observed in this present study, clinical significance was not obtained for various clinical parameters.

Limitation

- The sample size was small.
- Group was not homogeneous.
- Intraoperative variables were not included.

Conclusion

This study indicates better physical outcome in patients who are undergoing CABG and valve surgery in JIPMER, Puducherry. The outcome of this study are similar to many studies conducted in various centre across the world.

Implications

The findings of the study can be applied in various areas of nursing namely nursing practice, nursing education, nursing administration and nursing research.

Nursing practice: The current study shows the aspects of outcome in patients undergoing open heart surgery which includes postoperative pain level, postoperative complications, drug regime adherence, lifestyle modifications. This study stresses the importance of assessment of these aspects by nurses preoperatively and postoperatively. And it results in the better outcome of patients and prevention of complications. These aspects can be strengthened while planning for preoperative counseling and intervention.

Nursing education: It is important for the nursing students to know about the recovery process of patients undergoing cardiac surgeries in order to assess the risk factors, complications and provide preoperative education as well as discharge counseling. The curriculum of nursing students may include the detailed assessment of various factors and management of patients undergoing open heart surgery.

Nursing administration: The nurse administrators can apply these study findings to plan and implement various activities to improve outcome after cardiac surgeries. Preoperative and postoperative counseling services can be organized for the patients with the help of these findings. The healthcare professional should be motivated to provide these services through continuing education.

Nursing research: Evaluation of outcome of open heart surgery has quite a lot of aspects. The present study findings can be a basis for future research in this area. The study can be replicated with the larger population. Nurses can conduct studies to find various methods to improve the outcome of patients after cardiac surgeries.

Recommendations for further research

- Studies can be conducted to assess the long-term outcome after cardiac surgeries.
- The same study may be conducted with larger sample size and more components.
- Similar studies can be done for the patients undergoing other cardiac surgeries.
- Similar studies can be carried out to identify measures to improve outcome after cardiac surgery

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