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CORONARY ARTERY BYPASS GRAFTING IN SULAIMANI: A RETROSPECTIVE ANALYSIS OF THE RATE AND OUTCOME IN ONE-YEAR

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Abdulsalam Y Taha[1] , Bawar Abubakr Mohammed[1], Mohammed Omer Salim[1] , Shadyar Omer Faraj [1]
[1] Branch of Clinical Sciences, College of Medicine, University of Sulaimani

Corresponding Author: Abdulsalam Yaseen Taha
Email: abdulsalam.taha@univsul.edu.iq , ORCID: https://orcid.org/0000-0001-9492-5773

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Abstract

Background: Coronary artery disease (CAD) is a very common disease with its incidence steadily rising worldwide. The study aims to show our experience in management of CAD using coronary artery bypass grafting (CABG).

Patients and Methods: This retrospective study enrolled all patients who underwent CABG surgery in Sulaimani during 2023 whose medical files could be accessed. The patients were operated upon in Sulaimani Cardiac Hospital (SCH) (Public) and Anwar Sheikha Medical City (ASMC) (Private). Patients' medical files were reviewed, pertinent data was entered into a Microsoft Access database and the results were analyzed and statistically tested thereafter.

Results: CABG accounted for 59.2% of total procedures. The patients' ages ranged from 35 to 81 years, with a mean age of 59.6, and the majority were males (76.9%). The top risk factors were hypertension (55.8%) and diabetes mellitus (48.5%). Common symptoms included chest pain (72.3%) and dyspnea (53.1%). Most patients had multivessel CAD (89.0%) and a normal ejection fraction (74.7%). CABG was the primary procedure in 91.3%, accompanied with other surgeries in 8.7%, with mitral valve surgery being the most common additional procedure (5.9%). The study noted that left internal mammary artery (LIMA) and great saphenous vein (GSV) were the main grafts used. Majority (88.5%) of patients experienced no complications post-surgery, with median sternotomy wound infection being the most common complication. The average hospitalization period was 4.48 days, longer in private hospitals than in public ones. The study reported a 2.7% mortality rate within 30 days, which was significantly higher in the public hospital, among females, and those with lower preoperative ejection fractions. Prior PCI and concomitant surgeries had no statistically significant impact on the mortality.

Conclusions: CABG surgery is a time-tested safe and effective therapy for CAD. The annual rate, complications and mortality of CABG in this series were comparable to other studies.

Keywords: Coronary artery disease, coronary artery bypass grafting, percutaneous coronary intervention, morbidity, mortality.

Introduction

Coronary artery bypass grafting (CABG) remains the most common cardiac surgery performed today worldwide. [1,2] It is a time-tested operation for ischemic heart disease (IHD) for decades. Since first introduced in the mid-1960s, [1,3] CABG has become the standard of care for patients with coronary artery disease (CAD). Surprisingly, the fundamental surgical technique itself did not change much over time. However, outcomes after CABG have dramatically improved over the first 50 years mostly via refinements of the technique.[4,5] Despite the success of CABG surgery, the introduction of percutaneous coronary intervention (PCI) led to a reconsideration of therapeutic strategies.[2,4] Outcomes after surgical revascularization have the potential to improve beyond the level achieved during recent decades by adopting new techniques that increase procedural safety, patient satisfaction, and long-term survival.[4]

In Iraq, the modern-time CABG was started by Mr. Najih Hamza Al-Asadi FRCS (Ed.), a Cardiothoracic & Vascular Surgeon) in 1989 at Al-Rasheed Military Hospital, Baghdad.[6] Currently, this operation is a common procedure performed in both public and private cardiac centers in Iraq including the Region of Kurdistan.

The present study aims to find out the rate of CABG surgery in Sulaymaniyah as a proportion of total cardiac operations done in one-year period. By doing so, the health authorities would be informed about the real need of people for this type of cardiac surgery and provides the necessary budgets to it so that patients' waiting list could be shortened. In addition, the morbidity and mortality rates of CABG in our practice will be compared with cardiac surgery centers elsewhere in the world.

Patients and Methods

From January 1st, 2023 to December 31st, 2023, 260 patients (200 males, 76.9% and 60 females, 23.1%) underwent CABG ± other procedures in the public cardiac center [Sulaimani Cardiac Hospital (SCH)], and in a private cardiac center [Anwar Sheikha Medical City (ASMC)] in Sulaymaniyah, Iraq. The medical files of the relevant patients were reviewed and selected information was collected. The information included age, sex, job, clinical presentation, risk factors of IHD, history of previous PCI, ejection fraction (EF%), concomitant cardiac procedures such as valve surgery, types of grafts employed for CABG [saphenous vein graft (SVG), internal mammary artery (IMA), radial artery], number of implanted grafts, duration of stay in the hospital, postoperative complications and 30-day mortality.

The patients had a complete preoperative work-up including pulmonary function tests (PFTs), chest X-ray (CXR), electrocardiography (ECG), echocardiography, Doppler of carotid arteries, CT and/or conventional coronary angiography beside viral studies, complete blood count (CBC), erythrocyte sedimentation rate (ESR), fasting blood sugar (FBS), renal function tests (RFTs), liver function tests (LFTs), thyroid function tests (TFTs) and general urine exam (GUE). Prior to

surgery, every patient had to prepare 4 units of cross-matched blood, 5 units of plasma and 2 units (300 cc) of platelets.

CABG was performed according to a standard technique using median sternotomy incision. The number of grafts was dictated by the angiographic and intra-operative findings. Conduits were either IMA, SVG or radial artery. Most CABG procedures were performed under cardiopulmonary bypass (CPB) with topical and central cooling, cross-clamping of the aorta and cardioplegic arrest of the heart while the off-pump technique was very occasionally used. Patients with a smooth postoperative course were usually discharged home on the 3rd postoperative day while those with complications stayed longer in the hospital. The follow-up of the patients was done via scheduled visits to the hospital and/or the private clinic of the operating surgeon. Furthermore, some patients or their family members were phoned by the investigators in this study.

All collected data were entered into a database created by Microsoft Access program and the results were retrieved via specific queries and statistically analyzed thereafter.

Results

During one year period (1st January-31st December 2023), 260 patients underwent CABG surgery in SCH (n=208, 80%) and ASMC (n=52, 20%). Worthy to note that the total numbers of cardiac operations performed during the same period was 439, hence CABG comprised a rate of (59.2%).

More than 3 quarters (n=200, 76.9%) of the patients were males with a male to female ratio of 3.3 to 1. For males, the age ranged from 35 to 81 years with a mean of 59.54±9.10 while for females, the age ranged from 39 to 74 years with a mean of 59.91±8.36. Overall, the mean age of all patients was 59.63±8.92. The peak age for both genders was in the 6th and 7th decades of life (n=187, 72%). Patients aged above 70 (n=31) accounted for 11.9%. These figures are demonstrated in Table I

Table 1: Age and Sex Distribution

Age (years)	Males	Females	Total
31-40	3	1	4 (1.5%)
41-50	30	8	38 (14.6%)
51-60	80	22	102 (39.3%)
61-70	61	24	85 (32.7%)
71-80	25	5	30 (11.5%)
81-90	1	0	1 (0.4%)
Mean age ± SD	59.54±9.10	59.91±8.36	59.63±8.92
Total	200 (76.9%)	60 (23.1%)	260 (100%)

The distribution of the patients according to their jobs is shown in Table II**.** Job titles were not documented in (n=62, 23.8%) cases. The majority (46 out of 49, 93.9%) of female patients were housewives whereas the 3 common jobs for male patients were free works (49%), retired individuals (22.8%) and civil employee (12.8%).

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Table II: Job Distribution

Job	Males	Females	Total
Free worker	73	1	74
Housewife	0	46	46
Retired	34	0	34
Civil employee	19	1	20
Police	8	0	8
Soldier	6	0	6
Farmer	4	0	4
Teacher	2	1	3
Military officer	2	0	2
Engineer	1	0	1
N/A	51	11	62
Total	200	60	260

The residence addresses of the patients are detailed in **Table III.** Patients from Sulaymaniyah, Halabja and Rania constituted the majority (n=214, 84.3%) in this series whereas smaller numbers of patients came from the nearby Iraqi governorates.

Table III: Address Distribution

Address	Males	Females	Total
Sulaymaniyah	138	38	176
Halabja	13	9	22
Rania	11	5	16
Kirkuk	11	4	15
Baghdad	7	2	9
Diyala	7	1	8
Anbar	3	0	3
Salahdeen	2	1	3
Erbil	1	0	1
Mosil	1	0	1
N/A	6	0	6
Total	200	60	260

The monthly distribution of patients in the present study is displayed in Table IV**.** In both hospitals, the number of CABG operations ranged between 10 and 38 per month with an average of 21.7. In SCH, the monthly operations rate ranged between 8 and 31 with an average of 17.3. While in ASMC, the monthly operation rate was in a range of 0-8 with an average of 4.3. The average monthly and annual number of operations in SCH was 4 times that of ASMC. The waiting list varied from none in the private center to (1-10) months in the public center.

Table IV: Distribution of patients according to months of the year and hospital

Month/2023	SCH	ASMC	Total (n, %)
January	26	0	26
February	17	4	21
March	19	4	23
April	8	2	10
May	15	1	16
June	21	4	25
July	13	6	19
August	31	7	38
September	15	3	18
October	19	8	27
November	14	7	21
December	10	6	16
Average	17.3	4.3	21.7
Total	208 (80%)	52 (20%)	260 (100%)

The study involved 145 (55.8%) patients with hypertension and 126 (48.5%) with diabetes as top risk factors. Additional risk factors included smoking in 54 (20.8%) patients and hyperlipidemia in 12 (4.6%) patients. Furthermore, 34 (13.1%) patients had a family history of IHD. Chest pain and effort dyspnea were the most common complaints, reported by 188 (72.3%) and 138 (53.1%) patients, respectively. A majority of patients (56.5%) had not undergone PCI, while 38.8% had received PCI before CABG. Most patients (74.7%) had a normal EF above 50%, while 23.7% had mildly to moderately reduced EF (35-50%), and a small percentage (1.5%) had severely reduced EF below 35%. More Patients' Characteristics are shown in **Table V.**

Table V: Patients' Characteristics

Risk Factors (Some patients had multiple risk factors)	Number (%)
Hypertension	145 (55.8%)
DM	126 (48.5%)
Smoking	54 (20.8%)
Family history of IHD	34 (13.1%)
Hyperlipidemia	12 (4.6%)
Risk Factors not Identified	49 (18.8%)
Clinical Features (Some patients had multiple symptoms)	Number (%)
Chest pain	188 (72.3%)
Exertional dyspnea	138 (53.1%)
Heart Failure	12 (4.6%)
N/A	3 (1.2%)
PCI	Number (%)
Done before	101 (38.8%)

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Not done before	147 (56.5%)
Not documented	12 (4.6%)
Ejection Fraction %	Number (%)
> 50% (Normal EF%)	148 (74.7%)
35 to 50% (Mild to Moderately Reduced EF)	47 (23.7%)
EF<35% (Severely Reduced EF%)	3 (1.5%)
Range, mean±SD	30 to 71%, 55.8±8.8
Not mentioned	62 (23.8%)

The details of operative procedures and types of grafts implanted in the patients under study are shown in **Table VI.** The study noted that isolated CABG was the primary procedure in the majority of patients, with 232 out of 260 patients (91.3%) undergoing this specific surgery. In 22 patients (8.7%), CABG was performed alongside other procedures. However, in 6 patients (2.3%), the details regarding the number and type of graft used were not documented. The most common type of CABG performed was CABG X 3, seen in 149 patients (58.7%), followed by CABG X 2 in 50 patients (19.7%), and CABG X 4 in 41 patients (16.1%). The least common was CABG X 1, which was performed in 14 patients (5.5%).

Additionally, there were 15 patients (5.9%) who underwent mitral valve (MV) operations, with 11 requiring replacements and 4 undergoing repairs. Moreover, there were 5 patients (2.0%) who had aortic valve (AV) replacements. Other procedures included the repair of a left ventricular (LV) aneurysm and atrial septal defect (ASD) closure.

Regarding the grafts used in the patients, the left internal mammary artery (LIMA) was the most common, being implanted in 227 patients (89.3%). The great saphenous vein (GSV) was also frequently used, with 219 patients (86.2%) receiving this graft. The radial artery was harvested in 58 cases (22.8%). In contrast, the right internal mammary artery (RIMA) was used alone or in combination with LIMA in only a few cases.

Table VI: Surgical Procedures and Types of Grafts

Procedure	Number (%)	
CABG X1	6	14 (5.5) (12 males)
CABG X 1, MVR	4	
CABG X 1, MV Repair	3	
CABG X 1, closure of ASD	1	
CABG X2	46	50 (19.7) (35 males)
CABG X 2, MVR	1	
CABG X 2, AVR	2	
CABG X 2, Repair of LV aneurysm	1	
CABG X 3	140	149 (58.7) (115 males)
CABG X 3, MVR	5	
CABG X 3, MV Repair	1	
CABG X 3, AVR	3	
CABG X 4	40	41 (16.1) (34 males)
CABG X 4, MVR	1	
N/A	6 (2.3) (4 males)	
Total	260 (100)	
Types of Grafts		
LIMA	227 (89.3)	
GSV	219 (86.2)	
Radial Artery	58 (22.8)	
RIMA	4 (1.6)	
LIMA and RIMA	4 (1.6)	

Table VII reveals the postoperative complications. Most patients had a smooth postoperative course, with 88.5% of patients experiencing this. The most common complication among the remaining patients was median sternotomy wound infection, occurring in 5.8% of cases. Additionally, there were instances of patients being re-explored for bleeding (1.5%), experiencing wound dehiscence (1.5%), and one case of acute renal failure. The study found no statistically significant difference in the occurrence rates of these complications between the two hospitals (SCH and ASMC). However, it was noted that patients with non-complicated postoperative outcomes were significantly higher in the public hospital (SCH) compared to the private hospital (ASMC).

The study found that the duration of hospital stay for patients who underwent CABG in Sulaimani ranged from 1 to 30 days, with an average stay of 4.48 days. Specifically, in the private hospital (ASMC), the hospitalization period ranged from 3 to 30 days, with an average stay of 5.67 days. In contrast, in the public hospital (SCH), the hospitalization period ranged from 1 to 30 days, with an average stay of 4.18 days. Statistical analysis revealed that the difference in hospitalization periods between the two hospitals was significant, with a p-value of .000271, indicating significance at $p < .05$.

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The study highlights additional details regarding the outcomes of the patients who underwent CABG in Sulaimani. It appears that the majority of patients were discharged home well, except for a small percentage of cases with unfavorable outcomes. Specifically, the data states that 2.7% of patients (7 individuals) experienced early deaths. The causes of death varied and included low cardiac output in 2 patients, acute renal failure in 1 patient, and bleeding in 1 patient. However, the cause of death was unknown in 3 patients. Additionally, there were 3 patients (1.2%) whose outcomes were not known to the researchers. It is important to note that 6 out of the 7 deceased patients had undergone surgery at the public hospital (SCH), which was statistically significant (P=0.00758). Two dead patients had concomitant surgeries (P=.12602).

Table VII: Postoperative Complications

Complication	SCH	ASMC	Number (%)	P value*
None	185	45	230 (88.5)	p<0.00001
Median sternotomy wound infection	10	5	15 (5.8) (9 males)	.06724
Low cardiac output	3	1	4 (1.5) (2 males)	.15854
Acute mediastinitis	4	1	5 (1.9) (2 males)	.05744
Bleeding requiring re-exploration	3	1	4 (1.5) (3 males)	.15854
Wound dehiscence	3	1	4 (1.5) (3 males)	.15854
Stroke	2	1	3 (1.2) (3 males)	.41222
Acute renal failure	1	0	1 (0.38) (Female)	.15854
* Z Test for 2 Population Proportions was used.				

Discussion

Since its beginning more than 4 decades ago, CABG surgery has played an important role in minimizing symptoms and/or increasing survival in patients suffering from IHD.[7&8] When compared to drug-eluting stents, CABG is associated with lower rates of death or MI and repeat revascularization both in patients with two-vessel and three-vessel disease.[9]

The information provided by this study adds valuable insights about this procedure. It specifies that during one-year period, a total of 260 patients underwent CABG surgery in Sulaimani, Region of Kurdistan, Iraq. Out of these patients, 208 (80%) had their surgeries at the public cardiac center (SCH) and 52 (20%) at the private cardiac center (ASMC). These details provide a clearer picture of the distribution of CABG surgeries among the two mentioned cardiac centers and their proportion relative to the total cardiac operations performed within the study period. Furthermore, it is noted that during this same period, a total of 439 cardiac operations were performed in the two centers, indicating that CABG surgeries accounted for 59.2% of all cardiac procedures conducted. This statistic underscores the significance of CABG as a prevalent surgical intervention for CAD within the region during the specified timeframe.

Moreover, the study showed that the majority of patients who underwent CABG in Sulaimani were males, accounting for more than three-quarters of the total. The male to female ratio was 3.3 to 1, indicating a significant gender imbalance in the patients receiving CABG. Despite advancements in medical care, CABG still exhibits a significant male preponderance, with men accounting for the majority of the procedures performed due to factors such as higher prevalence of risk factors like smoking and diabetes.[10]

The age distribution of the patients showed that the average age for both males and females was close, with males ranging from 35 to 81 years and females from 39 to 74 years. The mean age for all patients combined was calculated at 59.63 years, with the peak age for patients undergoing CABG falling within the 6th and 7th decades of life, which accounted for the majority of cases. Patients above 70 (n=31) accounted for 11.9% in this series. Elderly people undergoing CABG are recognized to have higher risk of complications and longer hospitalization days.[11]

It is interesting to note the occurrence of CABG in younger patients as young as 35 years old in the study. This observation could indeed be attributed to the increasing prevalence of CAD in younger populations. Lifestyle factors such as sedentary lifestyles, poor dietary habits, smoking, and increasing rates of obesity can contribute to the development of CAD at a younger age. Additionally, genetic predisposition and other risk factors like hypertension and diabetes, as highlighted in the study, can also play a role in the earlier onset of CAD.[12]

The findings of the study underscore the importance of early detection and management of CAD risk factors even in younger individuals. Implementing lifestyle modifications, regular screening, and appropriate medical interventions can help mitigate the progression of CAD and potentially reduce the need for invasive procedures like CABG in younger age groups. Further research and public health initiatives may be necessary to address the growing burden of CAD in younger populations and promote cardiovascular health across all age groups .[8]

The study adds valuable insights into the demographics and occupations of the patients who underwent CABG surgery in Sulaimani. It is interesting to note that a significant portion of female patients were housewives, while male patients had various occupations such as free works, retired individuals, and civil employees. This information further enhances the understanding of the patient population and their backgrounds in relation to the study on CABG surgeries.

The average cost of CABG surgery in Iraq is significantly lower than in other Middle Eastern countries. The cost of the procedure typically ranges from 5,000 USD to 12,000 USD, while in the UAE, it can reach up to 30,000 USD or more. This difference in cost is primarily due to higher healthcare cost in these countries.[13] As a matter of fact, the calculated cost of CABG procedure in this study was even lower than reported before ranging from 2,200 USD (in the public center) to 6,700 USD (in the private center). However, in the current economic climate and looking at the occupations of the patients enrolled in the study, CABG surgery can be costly, making it a financial challenge for many people in Iraq. Access to affordable healthcare is crucial, and finding ways to make CABG surgery more financially accessible to the Iraqi people is an important consideration.

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With regard to gender, the operative outcomes after CABG in women have been worse than men without any improvement during the last decade.[14&15] Nevertheless, CABG surgery has yielded better outcomes in females with multi-vessel coronary artery disease when compared to PCI.[16] In the present series, 60 (23.1%) patients were females, of whom 56 (93.3%) had 2-4 vessel CAD with a death rate of (n=4, 6.7%) significantly higher than male death rate of (n=3, 1.5%) (P=0.03) but with no significant difference in the complication rates between the two genders.

The waiting list for CABG surgeries in Sulaimani varied depending on the availability of facilities and the healthcare setting. Patients in the private center (ASMC) had almost no waiting list, while those in the public center (SCH) experienced a waiting list that ranged from 1 to 10 months. This variation in waiting times in the public center was attributed to a policy where patients could choose their surgeon.

The data provided indicates that in the public center, the average monthly rate of CABG operations was 17.3, while in the private center, it was 4.3. This means that on average, the public center performed four times more CABG operations per month than the private center. This suggests a significant disparity in the volume of CABG operations between the two centers, with the public center handling a substantially higher caseload. The month-to-month variation in the rate of CABG surgery is mostly related to differences in the availability of facilities rather than a change in case referral for surgery.

The top risk factors observed in this study were hypertension (55.8%) and diabetes mellitus (48.5%). In contrast, hyperlipidemia was reported in 12 (4.5%) patients only which most likely due to under-reporting as the lipid profile tests results haven't been saved in the medical files of many patients. Common symptoms included chest pain (72.3%) and dyspnea (53.1%) which are usual in CAD.

In the present series, almost all patients underwent CABG using the on-pump technique, except for two individuals. Lamy et al trial indicates that the composite outcome of adverse events at a 5-year follow-up was similar between patients who had off-pump CABG and those who had on-pump CABG .[17] However, some research studies have suggested a potential decrease in stroke rates with off-pump CABG procedures.[8&18] Specifically, Puskas et al found a 35% reduction in stroke rates among patients who underwent off-pump CABG compared to those who had on-pump CABG.[18] Despite the routine use of on-pump CABG in our study, only three patients experienced strokes post-surgery. This information highlights the ongoing debate and research surrounding the choice of on-pump versus off-pump CABG techniques and their respective outcomes, particularly concerning the occurrence of stroke.

Advancements in graft selection, specifically the utilization of arterial grafts like the internal mammary artery and radial artery, have greatly improved the rates of graft patency and long-term survival for patients undergoing CABG. Arterial grafts, particularly the internal mammary artery and radial artery, have gained popularity due to their superior patency rates compared to venous grafts. The LIMA graft not only surpasses all other CAD treatments in terms of enhancing life expectancy and reducing symptoms, but also has shown remarkable durability throughout the lifespan of the graft, with patency rates beyond 10 and 15 years being quite common, as demonstrated by Tatoulis et al. Furthermore, the LIMA has become the standard choice for

grafting the left anterior descending artery due to its exceptional long-term patency rates and physiological similarity to the coronary artery. The use of radial artery grafts, which was once considered challenging, has become more widespread thanks to advancements in surgical techniques and patient selection criteria.[8,19&20] It is worth noting that arterial grafts (LIMA, RIMA, and radial artery) have been utilized more frequently than GSV grafts in this series, with a total of 293 instances compared to 219.

Concomitant CABG is often performed alongside other cardiac procedures, such as those for valvular heart disease and congenital heart disease. It is important to note that concomitant CABG carries a higher risk and may result in a poorer outcome.[21] When compared to isolated CABG, the combination of valve replacement or repair with coronary revascularization generally increases the risk of the operation. In cases where the combined procedure is necessary, the risk is further heightened if the valve dysfunction is caused by CAD, if there is severe left ventricular dysfunction, if the patient is classified as Class IV, or if an emergency operation is required.[22] In our current series, CABG was the primary procedure in the majority of cases (91.3%), while 8.7% of cases involved additional surgeries, with mitral valve surgery being the most common (5.9%). It is worth mentioning that although two of the deceased patients in this study underwent concomitant surgeries, this finding was not statistically significant (P=0.12602).

The majority of patients in both facilities experienced a favorable recovery after surgery, with no notable variance in the occurrence of complications between the two centers. The most frequently reported complication was infection in the median sternotomy wound. It is worth mentioning that out of the 15 patients who developed this particular complication, 4 of them (26.7%) were over the age of 70 (P= 0.01046).

In spite of ASMC being a privately-owned medical facility and SCH being a government-run hospital, patients admitted to ASMC experienced a notably lengthier average hospital stay compared to those at SCH. This discovery implies that there might be specific factors unique to ASMC that contribute to extended hospital stays for CABG patients, thus necessitating further investigation into the potential reasons behind this disparity in the duration of hospitalization between the two institutions.

In relation to PCI before CABG surgery, it has been reported that high institutional rates of prior PCI could lead to higher mortality rates following CABG.[23] A group of researchers conducted a review of literature spanning from 1998 to 2017 and discovered a correlation between a greater proportion of patients with prior PCI and increased relative mortalities post-CABG.[23] In our current investigation, 101 patients (38.8%) underwent PCI before CABG, and three out of the seven deceased patients (42.9%) had a history of prior PCI, this finding was not statistically significant (P=0.59612).

The reduction of death after CABG surgery can be achieved through careful patient selection, preoperative optimization, and improved surgical techniques.[7] Patients with worsening preoperative EF have a higher risk of mortality following isolated CABG surgery.[7] According to a study, patients with an EF<35% had a six-fold increase in in-hospital death rates compared to those with an EF>50% (7). In our current series, approximately 23.7% of patients had mild to moderately reduced EF (35 to 50%), while a small percentage (1.5%) had severely reduced EF

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(<35%). Interestingly, one out of six deceased patients in this series had an EF of 36% (p=0.02088).

The mortality rate observed in this study was 2.7%, which is similar to the previously reported range of 1.8-2% .[15] Notably, the mortality rate was significantly higher in females compared to males (6.7% vs. 1.5%) (P=0.03).

These post-operative outcomes and complications of this study are presented in a comprehensive manner through these findings. They offer valuable insights into the challenges and risks that are specifically associated with CABG procedures in this particular region.

Limitations

One key limitation of this study is the potential underestimation of the total number of patients who underwent CABG surgery in Sulaimani due to denied access to some patients' data. This may influence the accuracy and completeness of the findings. Additionally, suboptimal documentation leading to missed data, a common issue in retrospective studies, is identified as a weakness. Another significant limitation is the lack of long-term follow-up information in the medical files. This absence of data could hinder the ability to assess the outcomes and complications of CABG surgeries beyond the immediate postoperative period. Long-term follow-up data is crucial for evaluating the efficacy and safety of the procedure over time. While the study provides valuable insights into CABG surgeries in the region, these limitations should be taken into consideration when interpreting the results.

Conclusions

CABG surgery in Sulaimani cardiac centers yielded good outcomes comparable to other centers. Further studies on the long-term outcomes, quality of life post-CABG surgery and the impact of different grafting techniques are recommended.

List of Abbreviations

ASMC, Anwar Sheikha Medical City; AVR, aortic valve replacement; CABG, coronary artery bypass grafting; CAD, coronary artery disease; CBC, complete blood count; CPB, cardiopulmonary bypass; CT scan, computerized tomography scan; CXR, chest X-ray; DM, diabetes mellitus; ECG, electrocardiography; EF, ejection fraction; ESR, erythrocyte sedimentation rate; FBS, fasting blood sugar; GUE, general urine exam; IHD, ischemic heart disease; IMA, internal mammary artery; LFTs, liver function tests; LIMA, left internal mammary artery; MI, myocardial infarction; MVR, mitral valve replacement; N/A, not available; PCI, percutaneous coronary intervention; PFTs, pulmonary function tests; RFTs, renal function tests; RIMA, right internal mammary artery; SCH, Sulaimani Cardiac Hospital; SD, standard deviation; SVG, saphenous vein graft; TFTs, thyroid function tests.

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Authors' Contributions:
1. Abdulsalam Yaseen Taha, 2. Mohammed Omer Salim, 3. Bawar Abubakr Mohammed, 4. Shadyar Omer Faraj
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