A Comparative Study of Early Postoperative Complications of CABG between Diabetic and Non-Diabetic Patients in Imam Khomeini Hospital during April 2006-March 2009

Mishmast Nehi Ghasemali
Physiology Specialist; Assistant Professor, Zahedan University of Medical Sciences.

Ale Mohammad Mahmood
Anesthesiologist; Assistant Professor, Tehran University of Medical Sciences.

Abstract

Introduction:
Coronary artery bypass graft surgery (CABG) is followed by short-term and long-term complications such as surgical-site bleeding and infection, myocardial infarction and etc. Regarding the high proportion of patients with diabetes mellitus undergoing this surgery, understanding the impacts of this condition on CABG outcomes seems necessary. This study intends to compare postoperative complications between diabetic and non-diabetic patients after CABG surgery.

Methods:
The present research is a cross-sectional retrospective study, including 680 patients who underwent CABG in Imam Khomeini Hospital, Iran during April 2006 to March 2009. Patients’ demographic data and post-operative complications were obtained and analyzed.

Results:
680 patients were enrolled in this study, 440 of whom were males. 187 patients were diagnosed with diabetes. Our study indicates although there was no statistically significant difference in reoperations due to bleeding, overall infection, surgical-site infection, ATN incidence, and mortality rate between diabetic and nondiabetic patients, however cardio pulmonary bypass time (CPB) was significantly higher in diabetic patients.

Conclusion:
Diabetes increases cardiopulmonary bypass time, but does not majorly affect other CABG complications

Keywords: postoperative complications, diabetic, Imam Khomeini Hospital
1. Introduction

The prevalence of Diabetes Mellitus has reached the epidemic proportions in human populations throughout the world. The proportion has been increasing so fast that, in 2000 and 2010, almost 150 million and 221 million individuals had respectively been suffering from Diabetes Mellitus in general, %90 of which is Type II directly associated with obesity (1). The complications of chronic diabetes include coronary micro-vascular diseases ¹ (diabetic retinopathy, diabetic nephropathy), coronary macro-vascular diseases ² (atherosclerosis) and different neurological disorders (diabetic neuropathy). Neuropathy along with circulatory collapse, caused by atherosclerosis in hands and feet and decreased resistance to infections, can create chronic ulcers, especially leg ulcers, in diabetic patients (1). Diabetes Mellitus is a chronic disease in which either the insulin level (Diabetes Type I) or tissue-specific response to insulin (Diabetes Type II) or a combination of both would not suffice to maintain normal levels of plasma glucose. It also causes the imbalance of blood circulation levels of lipids and lipoproteins (Dyslipidemia) (2).

Diabetes deals with the abundance of extracellular glucose (Plasma) versus the deficiency of intracellular glucose in the absence of insulin. Therefore, the cell substitutes glucose for the catabolism of proteins and fats to supply energy which leads to ketosis and depletion of cellular protein and, in turn, abates the body resistance to infections (1). The other reason for the increase of blood glucose in diabetes is the glucostatic dysfunction of liver in the absence of insulin; that is, liver, too, increases blood glucose (1). On one hand, insulin is the main anabolic hormone which stimulates protein synthesis from Amino acid and triglyceride synthesis in the liver and adipose tissue and inhibits protein breakdown (catabolism) and lipolysis of triglyceride reserves. In total, the net effect of protein is on the storage of carbohydrates, protein and fat (2). On the other hand, seven different carriers (glucose transporters AKA GluT) have been identified for the entry of glucose to the cell namely Glut1, Glut2, Glut 3, Glut 4, Glut5, Glut6 and Glut7. It seems that each transporter has evolved for certain actions; for instance, Glut4 is an insulin-stimulated glucose carrier, primarily found in striated muscles (skeletal and cardiac) and adipose tissue, and is assigned for glucose uptake from the blood (1).

1.1. Coronary Artery Bypass Grafting (CABG)

With the improvements of revascularization procedures through the skin as well as surgery, the treatment of coronary heart disease has undergone many changes. However, in most patients with chronic stable angina, drug therapy (pharmacotherapy) is still the pioneering treatment; thus, surgeries such as CABG are done in the next stages. Like any other surgery,

¹ AKA Small Artery Disease or Small Blood Vessel Disease
² AKA Large Artery Disease or Large Blood Vessel Disease
CABG has short-term and long-term complications including surgical-site bleeding, surgical-site infection, myocardial infarction, acute renal failure, stroke, long-term need of ventilator and death (3).

Most complications are related to the technique of cardiac surgery including Cardiopulmonary Bypass (CPB). An important factor is the application of tools and manipulations during the surgery like inserting or removing cannula, partial or complete clamping and removing the clamps. These actions separate atherosclerotic plaques in patient’s aorta and causes embolism. The technical mistakes in bypass grafting can lead to the obstruction of grafts particularly saphenous vein grafts (4). The other complications include cardiac arrest, hypothermia, pulseless bypass, artificial perfusion, intense inflammatory response to the perfusion inside artificial surfaces, sternotomy and skin incision (5 &6). CPB systems have been designed to decrease the likelihood of the aforementioned complications. For instance, the technique of Mini-extracorporeal Circulation causes less inflammation complications (7).

Currently, since recent progresses have led to the application of CABG even in High Risk patients, the rate of complications and postoperative mortality haven considerably decreased (10). Research has shown that the overall incidence of complications has been reduced from %14.5 to %8.8 and the perioperative mortality has been declined to %1.8 (8).

### 1.1.1. Cardiac Complications after CABG

#### Myocardial Infarction (MI)

The diagnosis of myocardial infarction (MI) after CABG is a controversial issue because cardiac enzymes naturally increase and ECG changes due to the pericarditis. The risk factors for this condition include cardiomegaly, long-term use of CPB, previous history of CABG, and the association of CABG with other surgical operations (9).

#### Low Cardiac Output Syndrome (LCOS)

One of the main cardiac complications after CABG is Low Cardiac Output Syndrome as the result of the cardiac dysfunction. The risk factors for this clinical condition are cardioplegic arrest along with its subsequent cardiac damages, reduction of preload, increase of afterload due to hypertension, postoperative myocardial infarction (10).

#### Arrhythmias

Ventricular tachycardia arrhythmias, Brady arrhythmias and atrial fibrillation are the most common types of cardiac postoperative Arrhythmias (Irregular Heartbeat) in %15 to %40 of patients (11).
Pericarditis

Pericarditis including pericardial effusion and tamponade are amongst the other typical complications occurring due to the pericardial injuries after CABG. Pericardial effusion is the most common postoperative complication in %85 of cases (12 & 13).

Premature Graft Obstruction

Early graft obstruction (sooner than 30 days after the surgery) occurs in %5 to %10 of saphenous vein grafts which is usually a thrombotic occlusion as the result of technical dysfunctions of anastomosis. The risk is reduced by taking aspirin within 6 hours after the surgery (14).

1.1.2. Non-Cardiac Complications after CABG

Non-cardiac complications include bleeding (15), sternal wound infection, foot ulcer (16), Mediastinitis (17), Sepsis (Septicemia) (18), acute renal failure (19 & 20), venous thromboembolism (21), pleural effusion (22), aortic dissection (23), thrombocytopenia (24), readmissions (25) and gastrointestinal complications (26 & 27).

General recommendations to reduce some of the aforementioned complications are taking oral antibiotics to prevent surgical-site infections, controlling blood sugar before, during and after surgery to reduce the risk of wound infections, and taking antifibrinolytics to reduce bleeding (28).

Infections

The surgical-site of sternum and lower extremities may get infected. The sternal wound infection occurs mainly in %1 of patients. Women with breast cancers are considered as the high-risk group especially if they have been treated (29). Blood sugar control in diabetic patients can reduce the incidence of sternal wound infection (30).

Foot Ulcer

The incidence of foot ulcer complications after the removal of saphenous vein graft varies from %1 to %25 (almost %30 of surgical interventions include wound debridement, skin graft, vascular surgery, amputation and fasciotomy (32).

Mediastinitis

The cases of mediastinitis have been reported to occur in %0.9 to %1.3 of patients. It is associated with the high risk of postoperative mortality after CABG. Some studies indicated that the mortality rate in patients with mediastinitis was twice as much as the patients without mediastinitis (33). The risk factors of mediastinitis after CABG are diabetes mellitus (34 & 35), obesity (36), a long-time Surgery (33), a history of cardiac surgery (33), using staple to close the
skin (35), obstructive pulmonary disease (36) and dual antiplatelet therapy (aspirin and clopidogrel) (37).

Readmission

The rate of readmission within the early 4 to 6 weeks is about %13 to %16. The most common causes of readmission include infection (%28), heart failure (%16), ischemia or myocardial infarction (%8), pulmonary embolism or deep vein thrombosis (DVT) (%6). The surgeon’s experience of less than 100 CABG per annum as well as the femaleness of patients increase the risk of readmission (38).

With respect to the significance of patients’ blood sugar status in intraoperative and postoperative complications, especially in major surgeries, it is necessary to conduct specialized investigations into the intraoperative and postoperative complications in diabetic patients. The results of such studies can help physicians be more aware of the significance of blood sugar control, identify high-risk patients and reduce the postoperative complications.

The current study intended to compare the postoperative complications of CABG between diabetic and non-diabetic patients. Several research has been done concerning the effect of diabetes on different body systems and the significance of identifying high-risk patients to reduce postoperative complications by controlling the blood sugar.

Cohen et al. (1998) studied the rate of mortality and its causes in diabetic and non-diabetic patients within 30 days after CABG (39). In their prospective study, they collected data from patients by interviewing and profiling. Data included patients’ demographic information, history of disease, associated complications, and the results of catheterization. Accordingly, it was indicated that the rate of mortality was %5 in diabetic patients and %2.5 in non-diabetic patients. Furthermore, the dependent risk factors were femaleness of patients, involvement of three veins, left main disease within the 30-day mortality after CABG. Besides, one of major risk factors was left vernacular dysfunction in diabetic patients and chronic renal failure in non-diabetic patients. Consequently, Cohen et al. (1998) found that there is a significant difference in the pattern of mortality risk factors between diabetic and nondiabetic patients after CABG.

Coubal (2005) studied the effect of diabetes on mortality and morbidity after CABG in England (40). To this end, 6033 patients underwent surgery. Amongst them, 814 patients (%13.5) were diabetic (530 and 284 were treated with oral medications and insulin respectively). The diabetic patients were controlled by a diet and placed in the non-diabetic group. The results showed that the postoperative incidence of acute renal failure, sternal wound infection and inpatient stay were higher in patients with insulin-dependent diabetes (respectively P-0.002, P-0.039 and P-0.017). On the contrary, there was not any significant difference in these factors for patients treated with oral medications. They found that diabetes has a significant effect on
postoperative complications. However, the rate of mortality did not show any significant increase amongst diabetic patients.

Rajakarouna (2006) studied the effect of diabetes mellitus on short-term and medium-term postoperative complications of CABG (41). To this end, patients who had undergone CABG during 1996-2003 were assigned to diabetic and non-diabetic groups. That is, 5259 patients participated in the study amongst which 877 patients (%17) were diabetic. Most of the diabetic patients were female and had higher BMI (Body Mass Index), a history of congestive heart failure, low ejection fraction, renal failure, and more coronary arteries involvement (each P<0.001). The rate of mortality was %2.2 in diabetic and %1 in non-diabetic patients in the hospital stay. Furthermore, to compare the complications, there was a significant difference only in renal, neurologic and gastrointestinal complications between both groups (P≤0.001). Nevertheless, there was not any significant relationship between diabetes mellitus and infectious complications after surgery.

Karson et al. (2002) conducted an investigation under the title ‘‘does diabetes have an increasing effect on short-term mortality and morbidity in CABG patients?’’ (42). They aimed at determining the effect of diabetes mellitus on short-term mortality and morbidity in patients after CABG. In their retrospective study, conducted in 434 hospitals in North America, 146786 patients who had undergone CABG participated. Amongst them, 41663 and 105123 were respectively diabetic and nondiabetic. The rate of mortality and morbidity was examined accordingly on these patients. According to the results, the rate of 30-day postoperative mortality was %3.7 in diabetic and %2.7 in nondiabetic patients. The odds ratio was equal to %1.4. That is, it was %1.13 patients under oral medications treatment and %1.39 in patients under insulin treatment. Moreover, the rate of morbidity, infection and postoperative consequences (complications) was more prevalent in diabetic patients; besides, the risk-adjusted rate was %35 higher in diabetic than nondiabetic patients. Karson et al. found that diabetes mellitus is an important risk factor for mortality and morbidity in CABG patients.

In a retrospective study in Italy, Kastellokio et al. (2010) studied ‘‘the effect of diabetes on morbidity and mortality of patients under simultaneous CABG and heart valve surgeries in comparison with solitary valve surgery’’ (43). To this end, 10709 patients (9229 nondiabetic and 1480 diabetic patients) participated in the study from 2000 to 2009. According to the results of data analysis, diabetic patients had worse outcomes, than nondiabetic ones, including longer mechanical ventilation, longer hospitalization, acute renal failure, and finally mortality. Additionally, the respiratory failure was %3.7 in diabetic and %2.5 in non-diabetic patients (P-0.005).

Hadginie Kulao studied ‘‘the short-term and mid-term status of white and Asian patients after CABG in England’’ during 2002 – 2007 (44). Almost 2897 patients participated in the study. The results showed that Asian patients were younger, and had higher BMI and Diabetes
than white patients (each P<0.001). The rate of the 30-day mortality was 2.6% in Asian and 1% in white patients (P-0.02). He found that the high rate of early mortality in Asian patients contributes to the prevalence of diabetes amongst them. It can be concluded that race is a dependent factor on short-term and mid-term mortality after CABG.

In a systematic review and meta-analysis study in China with the title ‘‘prognosis of diabetic patients compared with nondiabetic patients after CABG’’, Zhang et al. (2011) intended to determine the effect of diabetes mellitus on mortality and morbidity of patients after CABG with the past decades (45). They reviewed the articles written from 1981 to 2008. Totally 100217 patients (28168 with DM and 72049 without DM) participated in the study. According to the results, there was a statistically significant difference between diabetic and nondiabetic groups in terms of cerebral complications, acute renal failure, sternal infection and blood transfusion. Nonetheless, there was not any statistically significant difference between both groups in terms of atrial fibrillation, myocardial infarction and bleeding after the surgery. They found that patients with diabetes mellitus are more exposed to the risk of mortality, stroke, renal failure, sternal wound infection, and blood transfusion after CABG than nondiabetic patients.

The current study intended to compare the postoperative complications of CABG between diabetic and non-diabetic patients with respect to the findings of the studies above as well as the effects of diabetes on different body systems and the significance of identifying high-risk patients to reduce postoperative complications by controlling the blood sugar.

2. Methods and Materials

The present research is a cross-sectional retrospective study. The intended population included the patients who underwent CANBG in Imam Khomeini Hospital, Iran during April 2006-March 2009.

**Inclusion Criteria**

All the patients who underwent solitary CABG in Imam Khomeini Hospital during the intended interval were included in the current study.

**Exclusion Criteria**

The patients who underwent simultaneous CABG and Heart Valve Surgeries or had incomplete profile were excluded from the present study.

**Sampling Method**

The Convenience sampling methods was used to attain the required samples.

The study included all patients who underwent CABG during the intended three years in Imam Khomeini hospital. Hence, the sample size was equal to all the population under study. Data were collected with reference to the patients’ dossiers as well as a questionnaire. First, the
archives of the hospital and all the patient’s dossiers conforming to the inclusion criteria were reviewed and classified. Then, the questionnaire related to each patient was filled out according to the information of their profiles, operation report sheet and physician assistants. Finally, the obtained data were statistically analyzed.

The independent and dependent variables included sex (male or female), diabetes mellitus (fast blood sugar 126 mg/dL and above), smoking status (smoker or non-smoker), obesity (BMI above 30), reoperation (due to bleeding or cardiac tamponade), surgical-site infection (surgical-site purulent discharge), mortality (no vital signs within the postoperative 24 hrs.), and mechanical ventilation (treatment time), CPB time and aortic cross-clamp time.

With respect to moral considerations, the identity of all participants was protected and not disclosed to a third-party because the obtained data were recorded on the forms without any personal information or case number. Since, there was not immoral problem since the patients were not directly involved in the process of investigation.

3. Data Analysis

Data were analyzed using SPSS17 as well as descriptive (mean, median and SD) and analytical (T-test, X² and ANOVA) statistical measurements. The results of data analysis were presented in tables associated with captions and descriptions.

4. Research Results

The results are related to dossiers of 680 patients who participated in the study providing complete require information. First, the personal information (demographic) of patients were analyzed. Next, the study compared the incidence of postoperative complications between diabetic and nondiabetic groups. The obtained results are described in separate tables.

Table 1 presents the personal information of patients before surgery including sex, smoking status and obesity (MBI≥30). The resulted indicate that there was not any statistically significant difference between diabetic and nondiabetic patients in terms of the aforementioned information (P≤0.05).

Table 2 shows the values of mean, maximum and minimum CPB time, cross-clamp time and mechanical ventilation time for all patients regardless of their diabetes.

Table 3 compares CPB time, cross-clamp time, mechanical ventilation between diabetic and nondiabetic patients. According to the results, CPB time is significantly higher in diabetic than nondiabetic patients.

Table 4 compares the postoperative complications of CABG including reoperation due to bleeding, overall infection, surgical-site infection, ATN incidence, and mortality rate between
diabetic and nondiabetic patients. The statistical analysis of the comparison results showed that there was no statistically significant difference between diabetic and nondiabetic patients.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Male</th>
<th>Female</th>
<th>Diabetic Mellitus</th>
<th>Non-Diabetic Mellitus</th>
<th>Total</th>
<th>Chi-Square</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>121(%27.3)</td>
<td>66(%28)</td>
<td>323(%72.7)</td>
<td>170(%72)</td>
<td>444</td>
<td>0.843</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Smoking Status</td>
<td>Smoker</td>
<td>Non-Smoker</td>
<td>44(%25)</td>
<td>132(%75)</td>
<td>176</td>
<td>0.438</td>
<td>Not Significant</td>
</tr>
<tr>
<td>BMI</td>
<td>BMI≥30</td>
<td>BMI≤30</td>
<td>21(%36.8)</td>
<td>36(%63.2)</td>
<td>57</td>
<td>0.099</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>166(%26.6)</td>
<td>457(%73.4)</td>
<td>143(%28.4)</td>
<td>361(%71.6)</td>
<td>623</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 1:** The comparison of preoperative characteristics (sex, smoking status and obesity) between diabetic and nondiabetic patients

**Descriptive Statistics**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPB Time (min.)</td>
<td>680</td>
<td>40</td>
<td>835</td>
<td>111.97±49.844</td>
</tr>
<tr>
<td>Cross-Clamp Time (min.)</td>
<td>680</td>
<td>30</td>
<td>390</td>
<td>65.40±31.080</td>
</tr>
<tr>
<td>Mechanical Ventilation Time (days)</td>
<td>680</td>
<td>1</td>
<td>5</td>
<td>2.23±.921</td>
</tr>
</tbody>
</table>

**Table 2:** The values of mean, minimum and maximum CPB time, Cross-clamp time and Mechanical Ventilation time for all the intended patients.

**Group Statistics**

<table>
<thead>
<tr>
<th></th>
<th>Diabetic Mean ± SD</th>
<th>Non –Diabetic Mean ± SD</th>
<th>t-test</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPB Time (min.)</td>
<td>48.615 (187) ± 117.93</td>
<td>110.2 ± 49.507 (493)</td>
<td>0.048</td>
<td>Significant</td>
</tr>
<tr>
<td>Cross-Clamp Time</td>
<td>30.767 (187) ±</td>
<td>31.15 (493)</td>
<td>0.533</td>
<td>Not</td>
</tr>
<tr>
<td>Table 3: The comparison of CPB time, cross-clamp time, mechanical ventilation between diabetic and nondiabetic patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Significant</strong> ± 65.13</td>
<td><strong>Not Significant</strong> ± 2.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical Ventilation Time (days)</strong></td>
<td><strong>0.869 (187) ± 2.16</strong></td>
<td><strong>0.939 (493) ± 2.26</strong></td>
<td><strong>0.170</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4: The comparison of different postoperative complications of CABG between diabetic and nondiabetic patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reoperation for Bleeding</strong></td>
</tr>
<tr>
<td>Reoperation</td>
</tr>
<tr>
<td>No-Reoperation</td>
</tr>
<tr>
<td>177 (%27.1)</td>
</tr>
</tbody>
</table>

| **Infection after operation** |
| Infection | Non-Diabetes Mellitus | Total | Chi-Square P-value |
| No-Infection | 11 (%28.9) | 27 (%71.1) | 38 | 0.837 |
| 176 (%27.4) | 466 (%72.6) | 642 | Not Significant |

| **Site of Infection** |
| Sternum Leg | Non-Diabetes Mellitus | Total | Chi-Square P-value |
| Sternum & Leg | 6 (%24) | 19 (%76) | 25 | 0.438 |
| 5 (%41.7) | 7 (%58.3) | 12 | Not Significant |
| 0 (0) | 1 (%100) | 1 | |

| **ATN after Operation** |
| ATN No-ATN | Non-Diabetes Mellitus | Total | Chi-Square P-value |
| No-ATN | 14 (%23.3) | 46 (%76.7) | 60 | 0.449 |
| 173 (%27.9) | 447 (%72.1) | 620 | Not Significant |

| **Mortality** |
| Mortality Survival | Non-Diabetes Mellitus | Total | Chi-Square P-value |
| Survival | 17 (%24.6) | 52 (%75.4) | 69 | 0.574 |
| 170 (%27.8) | 441 (%72.2) | 611 | Not Significant |
5. Discussion

Several research has been done concerning the effect of diabetes on different body systems and the significance of identifying high-risk patients to reduce postoperative complications by controlling the blood sugar.

Cohen et al. (1998) studied the rate of mortality and its causes in diabetic and non-diabetic patients within 30 days after CABG (39). In their prospective study, they collected data from patients by interviewing and profiling. Data included patients’ demographic information, history of disease, associated complications, and the results of catheterization. Accordingly, it was indicated that the rate of mortality was %5 in diabetic patients and %2.5 in non-diabetic patients. Furthermore, the dependent risk factors were femaleness of patients, involvement of three veins, left main disease within the 30-day mortality after CABG. Besides, one of major risk factors was left vernacular dysfunction in diabetic patients and chronic renal failure in non-diabetic patients. Consequently, Cohen et al. (1998) found that there is a significant difference in the pattern of mortality risk factors between diabetic and nondiabetic patients after CABG.

Coubal (2005) studied the effect of diabetes on mortality and morbidity after CABG in England (40). The results showed that the postoperative incidence of acute renal failure, sternal wound infection and inpatient stay were higher in patients with insulin-dependent diabetes. On the contrary, there was not any significant difference in these factors for patients treated with oral medications. They found that diabetes has a significant effect on postoperative complications.

Rajakarouna (2006) studied the effect of diabetes mellitus on short-term and medium-term postoperative complications of CABG (41). To this end, patients who had undergone CABG for the first time during 1996-2003 were assigned to diabetic and non-diabetic groups. The rate of mortality was %2.2 in diabetic and %1 in non-diabetic patients in the hospital stay. Furthermore, to compare the complications, there was a significant difference only in renal, neurologic and gastrointestinal complications between both groups.

Karson et al. (2002) conducted a retrospective investigation in 434 hospitals in North America under the title “does diabetes have an increasing effect on short-term mortality and morbidity in CABG patients?” (42). They aimed at determining the effect of diabetes mellitus on short-term mortality and morbidity in patients after CABG. According to the results, the rate of 30-day postoperative mortality was %3.7 in diabetic and %2.7 in nondiabetic patients. Moreover, the rate of morbidity, infection and postoperative consequences (complications) was more prevalent in diabetic patients. Karson et al. found that diabetes mellitus is an important risk factor for mortality and morbidity in CABG patients.

In a retrospective study in Italy, Kastellokio et al. (2010) studied “the effect of diabetes on morbidity and mortality of patients under simultaneous CABG and heart valve surgeries in comparison with solitary valve surgery” (43). According to the results of data analysis, diabetic
patients had worse outcomes, than nondiabetic ones, including longer mechanical ventilation, longer hospitalization, acute renal failure, and finally mortality. Additionally, the respiratory failure was %3.7 in diabetic and %2.5 in non-diabetic patients.

Hadginie Kulao studied “the short-term and mid-term status of white and Asian patients after CABG in England” during 2002 – 2007 (44). The results showed that Asian patients were younger, and had higher BMI and Diabetes than white patients. The rate of the 30-day mortality was %2.6 in Asian and %1 in white patients. He found that not only the high rate of early mortality in Asian patients contributes to the prevalence of diabetes amongst them but also race is a dependent factor on short-term and mid-term mortality after CABG.

In a systematic review and meta-analysis study in China with the title “prognosis of diabetic patients compared with nondiabetic patients after CABG”, Zhang et al. (2011) intended to determine the effect of diabetes mellitus on mortality and morbidity of patients after CABG with the past decades (45). They reviewed the articles written from 1981 to 2008. Totally 100217 patients (28168 with DM and 72049 without DM) participated in the study. They found that patients with diabetes mellitus are more exposed to the risk of mortality, stroke, renal failure, sternal wound infection, and blood transfusion after CABG than nondiabetic patients.

Different studies have shown that a majority of patients, undergoing CABG, suffers from diabetes. The present study showed that %27.5 of CABG patients had diabetes. Whereas, this percentage was reported to be %13.8 by Kastellokio et al. (2010), %28.10 by Zhang et al. (2011), %28 by Karson et al. (2002). The results of the current study are relatively consistent with the findings of other similar studies.

In addition to diabetes, other preoperative factors are considered as risk factors for the incidence of coronary artery atherosclerosis. Different factors including patients’ sex, obesity and smoking status were examined. Although it seemed that the aforementioned factors (sex, obesity and smoking status) could have significant effects of postoperative complications, the statistical analysis showed that there was not any statistically significant difference between diabetic and nondiabetic patients in terms of sex, obesity and smoking status. This indicates the homogeneity of both diabetic and nondiabetic groups.

The main purpose of the present study was comparing the early postoperative complications of CABG between diabetic and nondiabetic patients. The complications included reoperation (due to bleeding), surgical-site infection, ATN incidence, longer CPB time, Cross-clamp time and mechanical ventilation time, and finally mortality. The results of comparison showed that there was a statistically significant difference between both groups only in terms of CPB time.
Despite the fact that patient’s history of diabetes can be effective in causing infectious wounds after CABG, the present study, like Rajakarouna (41), showed that there was not any statistically significant relationship between diabetes and infection.

Kastellokio et al. (2010) reported that diabetic patients had worse outcomes, than nondiabetic ones, including longer mechanical ventilation; the same was the case in the present study even though it was not significant.

Notwithstanding a significant relationship, the high rate of postoperative complications in diabetic patients can be attributed to the lack of blood sugar control. It seems that the complications can be reduced by proper control of blood sugar.

According to Rajakarouna, the rate of mortality was %2.2 in diabetic and %1 in nondiabetic patients; however, the difference was not statistically significant between both groups. On the other hand, Kulao, who conducted a race-based comparative study in England, found that there was a statistically significant difference between Asian patients and white patients in terms of mortality rate. He proposed that the high rate of early mortality contributes to the prevalence of diabetes amongst Asian patients.

Different results have been observed in terms of mortality between diabetic and nondiabetic patients in different societies. For instance, the rate of mortality was reported to be %5 in diabetic and %2.5 in nondiabetic patients by Cohen, %2.2 in diabetic and %1 in nondiabetic patients by Rajakarouna, %3.7 in diabetic and %2.7 in nondiabetic patients by Karson, and %2.6 in Asian diabetic and %1 in white diabetic patients by Hadginie Kulao. On the contrary, the present study showed that the rate of mortality was %9 in diabetic and %10.5 in nondiabetic patients indicating a higher mortality rate than aforementioned studies. Nevertheless, it also specified that mortality was lower in diabetic than nondiabetic patients as the results of different characteristics of the intended population.

It is worth noting that the statistical populations and sample size were different in various studies. That is, they were 2897 in Hadginie’s study, 5259 in Rajakarouna’s study, 10709 in Kastellokio’s study, 100217 in Zhang’s study and 146786 in Karson’s study. Definitely, the results of the present study, with 680 patients, would not be comparable with the aforementioned studies to the heterogeneity of populations and smaller sample size.

Furthermore, various abovementioned studies showed different postoperative complications of CABG, except for renal failures, in diabetic patients. For instance, Coubal reported renal failure, sternal wound infection, longer hospitalization in diabetic patients. Rajakarouna outlined neurological and gastrointestinal complications in addition to renal failures. Kastellloko indicated that diabetic patients had longer stay, longer mechanical ventilation, more renal failure and stroke. Zhang found that diabetic patients were more exposed to stroke, renal failure, sternal wound infection and blood transfusion. Nevertheless, the present
study showed that only CPB time was significantly higher in diabetic patients than nondiabetic. Even though other complications also showed a higher value in diabetic than nondiabetic patients, they were not significant. For instance, almost %41.7 of the patients with foot ulcer as well as %35.7 of the patients who need reoperation due to bleeding were diabetic.

6. Suggestion

It is recommended to conduct a precise prospective investigation into the outcomes of CABG in diabetic and nondiabetic patients.

References:


