

## IMPACT OF PREOPERATIVE DIABETES MELLITUS ON MORBIDITY IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFT SURGERY

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### **Contribution**

All the authors contributed significantly to the research that resulted in the submitted manuscript.

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### **ABSTRACT**

**Objective:** To determine the impact of diabetes mellitus (DM) on morbidity in patients undergoing coronary artery bypass surgery (CABG).

**Methodology:** This descriptive cross sectional study was conducted at Quaid-e-Azam Medical College/ Bahawal Victoria Hospital Bahawalpur from 1<sup>st</sup> May, 2014 to 31<sup>st</sup> May 2015. Patients who had undergone coronary artery bypass grafting were included. Patients operated in emergency and who underwent simultaneous valvular and congenital heart surgery were excluded. Patients were randomly divided into 2 groups, Group 1 : diabetics and Group 2: non-diabetics by computer generating method. In-hospital morbidity was defined as surgical site infection, acute kidney injury, Stroke and arrhythmias. P-value  $\leq$  0.05 was taken as significant. SPSS version 20 was used

**Results:** About 102 patients of both genders were included. The mean age of patents was  $59.62 \pm 16.15$  years. Hypertension was significantly more commonly found in Diabetics compared to Non Diabetics (78.4% vs. 52.9%). Body Surface Area and pre-operative creatinine were insignificantly associated with DM. Acute kidney injury was found in 43.1% patients in diabetic group and in 23.5% patients in non-diabetic group. Morbidity i.e. infections 9(17.6%) and the composite outcomes i.e. post operative stroke 1 (2%) occurred more commonly in diabetic patients as narrated by the patient.

**CONCLUSION:** Patients with DM are at significantly greater risk of serious postoperative complication when compared with non-diabetics after coronary artery bypass graft surgery.

**Key Words:** Diabetes Mellitus, Body Surface Area, Coronary Artery Bypass Grafting

## INTRODUCTION

Diabetes mellitus is one of the major risk factor for coronary artery disease. It affects the intra-operative as well as postoperative course of the patients undergoing coronary artery bypass grafting.

Approximately 20 to 30% of patients undergoing (CABG) have diabetes mellitus.<sup>1</sup> High perioperative blood glucose level is independently characterized the causes of short-term mortality and morbidity in patient undergoing CABG. Diabetes mellitus (treated with medication) increases in-hospital mortality and morbidity 23 to 37% compared with patients without DM and it has been changing over time.<sup>2</sup>

Diabetic patients who are treated with insulin have high risk of death 39% and postoperative complications 50% to 61%. It is important to have a check on glycemic control in both diabetic and non-diabetic patients after CABG.<sup>3</sup>

Diabetes is not only the cause of hyperglycemia but also a cause of marked inflammatory response that occurs after cardiopulmonary bypass resulting in increased levels of stress hormones. The hyperglycemia thus developed is pro-inflammatory and perpetuates itself. At a cellular level it causes an increase in pro-inflammatory transcription factors which induce production of proinflammatory cytokines TNF - alpha, IL<sub>1</sub>, IL<sub>2</sub>, IL<sub>6</sub>, IL<sub>8</sub> and IL<sub>18</sub>. This leads to worsening of the hyperglycemia. One of the resultant effects is an increase of blood glucose levels even in non diabetics and more so in Diabetics.<sup>4</sup>

South Asian countries including Pakistan share the highest burden of cardio-vascular diseases world wide especially in diabetics. Good glycemic control in pre-operative phase is known to decrease the risk of mortality and morbidity after CABG surgery. Thus, we studied to find out the in hospital outcome of patients with diabetes mellitus undergoing coronary artery bypass grafting at a tertiary care center.

## METHODOLOGY

This descriptive cross sectional study was conducted at Quaid-e-Azam Medical College/ Bahawal Victoria Hospital Bahawalpur from 1<sup>st</sup> May, 2014 to 31<sup>st</sup> May 2015. It included patients who visited OPD on their 1<sup>st</sup> follow up, age ranging from 30-80 years.

Patients fulfilling the criteria of preoperative diabetes mellitus defined according to the guidelines of the World Health Organization (WHO) classification (fasting glucose  $\geq$  200 mg/dl), who underwent isolated CABG surgery were included, while patients with repair of complex congenital abnormalities, without cardiopulmonary bypass, undergoing valvular, urgent or emergency procedures, preoperative acute renal failure (anuria or oliguria urine out put < 10 ml/hour) and history of previous cardiac surgery were excluded from study.<sup>5</sup>

All patients were randomly divided in diabetic (define as fasting glucose  $\geq$  200 mg/dl) and non diabetic groups. Post operative complications like, post operative renal failure was defined as a serum creatinine level  $\geq$  2 mg/dL after surgery, infection (define as the infections with microbiological documentation or clinical laboratory evidence (purulent drainage, pain or tenderness, redness or heat, localized swelling, leukocytosis, sternal instability) were observed in patients.<sup>6,9,10</sup>

Data was analyzed by using SPSS (Statistical Package for Social Sciences) Version 20. Mean  $\pm$  S.D was given for quantitative variables. Frequencies, percentages and graphs were given for qualitative variables. Chi square test and Fisher exact test (if cell frequency was less than 5) was applied to observe the association of the qualitative variables with diabetic and non diabetic group, while for quantitative variable independent t test was applied. Level of significance will be considered  $\leq$  5%. All tests applied were two tailed.

## RESULTS

The study included 102 patients . About 37.3% of the total females were found to be daibetic. Diabetic patients were observed to be older with mean ageof 57.8 $\pm$ 8.6 years. Hypertension was found to be more common co morbid condition in diabetics, while other co morbidities were found to be slightly similar in diabetic as well as in non diabetics (Table-1).

Post operative complications in patients undergoing cardiac surgery are shown in Table 2. In diabetic group post operative renal dysfunction, infections and stroke were found to be more in CABG patients having pre operative diabetes (p < 0.05).

**Table 1: Demographical and Clinical Characteristics of Patients**

Variables	Diabetics	Non-Diabetics	P value
Gender	Male	32(62.7%)	0.001
	Female	19(37.3%)	
Age	57.8 $\pm$ 8.6	54.45 $\pm$ 7.1	0.048
Hypertension	40(78.4%)	27(52.9%)	0.012
Smoking	14(27.5%)	12(23.5%)	0.812
Family history of IHD	10(19.6%)	10(19.6%)	1.25
BSA	1.78 $\pm$ 0.19	1.79 $\pm$ 0.19	0.871
Pre operative creatinine	0.99 $\pm$ 0.42	1.03 $\pm$ 0.35	0.58
Post-op insulin	49(96.1%)	25(49.0%)	0.001
Anti-platelets	44(86.3%)	40(78.4%)	0.437
Beta-blockers	27(52.9%)	37(72.5%)	0.065
Calcium channel blockers	14(27.5%)	12(23.5%)	0.821
Statins	50(98.0%)	48(94.1%)	0.0617

**Table 2: Post operative complications in Diabetics who underwent CABG**

Outcomes	Diabetic	Non-diabetic	P-value
Renal failure	22(43.1%)	12(23.5%)	0.048
Infections	9(17.6%)	4(7.8%)	0.034
Post operative Stroke	1(2.0%)	0(0%)	1.00

## DISCUSSION

Our results showed that female group of diabetic patients were higher than the non diabetic patient indicating that women are at increased risk of pre-operative diabetes mellitus as (82.6%). Thourani VH and Moshtaghi N et al found that concluded that the diabetic patients were more likely female as (31% vs. 19.0%).<sup>13,14</sup> Another study by Koochemeshki V and Taggart DP et al established that female group of diabetic patients is significantly more likely than non diabetic patient as (65.27% vs. 41.40%) and (42% vs. 23%) respectively.<sup>15</sup> Present study demonstrated similar results.

However, our study findings differed from Carson JL et al who found that preoperative diabetes was common in both genders as compare to non diabetic (68% vs.74%).<sup>16</sup>

The present study provides evidence that diabetic patients were older ( $57.8 \pm 8.6$  years) and had greater co morbidities i.e. hypertension (78.4%). Moshtaghi N and Koochemeshki V et al reported that diabetic patients were older as mean age ( $59.18 \pm 8.71$  and  $58.6 \pm 9$  years) and had more co morbid conditions i.e. hypertension (64.5% vs. 47.3%) and (51.4% vs. 38.4%) respectively , while smoking was observed to be less common (28.6% vs. 43.9%) and (15.6% vs. 18.3%) respectively in patients who undergone CABG with diabetes mellitus.<sup>15,17</sup>

Post-operative infection after surgical procedure is commonly caused by diabetes mellitus.<sup>19</sup> Priscila L et al found that the occurrence of any type of infection was higher in patients with DM (62% vs. 38%) when compared with those without DM.<sup>20</sup> Koochemeshki V et al found postoperative infection was 4.6% in patients with diabetes mellitus.<sup>15</sup> Mannan M et al examined a risk of infection as 16.21% in patients with diabetes mellitus.<sup>21</sup> Carson JL et al reported postoperative infection 17.4% in diabetic patients who underwent CABG.<sup>16</sup> In our study, the postoperative infection rate was 17.6% and rate was similar to that reported in Carson JL study.<sup>16</sup>

Mannan M et al found postoperative stroke was 8.1% in diabetic patients.<sup>21</sup> Herlitz J et al reported higher incidence of stroke in diabetic patients as compared to non-diabeticsas (6.3% vs. 2.5%).<sup>19</sup> Carson JL et al reported postoperative stroke 2.3% vs. 1.4% in diabetic patients who underwent CABG.<sup>16</sup> Present study showed similar results.

Postoperative AKI in diabetic patient is higher as compared to non diabetic patients. Our study showed a 43.1% of acute kidney injury in this context Oezkur M et al reported high incidence 46.9% of renal failure in patients underwent CABG with diabetes mellitus.<sup>23</sup> Calafiore AM et al found postoperative AKI in 15% of the patients who underwent CABG with diabetes mellitus, present finding showed dissimilar results due to maintaining good perfusion pressure and flow during CPB in diabetic patients, minimizing renal damage or extra-renal filtration procedures.<sup>24</sup>

## LIMITATIONS

We did not consider the two subgroups of diabetes( insulin-dependent and non-insulin-dependent) separately. Furthermore, it is recommended that our findings should be confirmed by doing further studies with long term follow up.

## CONCLUSION

Diabetes mellitus is an important risk factor for mortality and morbidity among those undergoing CABG. Patients with diabetes mellitus are at significantly greater risk of death or suffering a serious postoperative complication when compared with non diabetics after coronary artery bypass graft surgery. Diabetic patients represent 50%of all patients undergoing CABG. While the absolute difference in mortality and morbidity between patients with and without DM is modest, the absolute difference is substantial when comparing patients with insulin-treated DM to those without DM. There are also significant healthcare costs associated with these poor outcomes.

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