

# Impact of Elevated Glycosylated Haemoglobin on Outcomes Following CABG in Patients with Diabetes Mellitus

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## ABSTRACT

**Objective:** To determine the impact of HbA1c on clinical outcome after coronary artery bypass graft surgery in patients with diabetes mellitus.

**Study Design:** Randomized control trial.

**Place and Duration of study:** Department of Cardiac Surgery, Faisalabad Institute of cardiology, Faisalabad from 1<sup>st</sup> June 2019 to 30<sup>th</sup> June 2020.

**Methodology:** Five hundred patients who underwent isolated coronary artery bypass graft surgery were included and stratified into two groups according to HbA1c levels. Control group have patients with HbA1c levels less than 7% while Study group have patients with HbA1c levels greater than 7%. Postoperative atrial fibrillation (AF), myocardial infarction (MI), hospital stay, time on ventilator, stroke, wound infection, in-hospital and 30 day mortality were recorded and compared.

**Results:** There are statistically significant results in terms of hospital stay, time on ventilator and wound infection (p-value 0.001).

**Conclusion:** HbA1c is good predictor of in hospital morbidity, so it is necessary to have strict glycaemic control to prevent postoperative complications.

**Keywords:** Glycosylated haemoglobin, Coronary artery bypass grafting, Diabetes, Myocardial infarction, Wound infection, Stroke, Mortality

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## INTRODUCTION

Diabetes mellitus is a metabolic syndrome and is known to be a major independent risk factor after optimizing other factors such as age, smoking, hypertension and hypercholesterolemia for development and progression of coronary artery disease and surgical complications.<sup>1,2</sup> Recently more than 55% of the patients with diabetes mellitus have coronary artery disease which was 19% in the past.<sup>3</sup> Of all these diabetic patients 20% of the patient underwent coronary artery bypass graft surgery.<sup>4,5</sup> Glycosylated haemoglobin (HbA1C) is found to be major predictor for assessment of glycaemic control of diabetic patients as it measures the mean glucose levels over previous 3 to 4 months<sup>6,7</sup> and there is about 4 time increase in risk of mortality in patients with HbA1C levels greater than 8.6%.<sup>8,9</sup>

There is strong association of diabetes mellitus and postoperative morbidity/mortality affecting short term and long term survival after coronary artery bypass graft surgery.<sup>11-12</sup> Moreover, patients with diabetes mellitus having coronary artery bypass graft surgery are more prone to develop surgical site infections and new onset of atrial fibrillation (AF).<sup>13,14</sup> Current guidelines of the American Diabetes Association suggests to have HbA1C levels of at least less than 7%.<sup>15</sup> The aim of this study is to assess the postoperative adverse outcome of raised HbA1C levels in diabetic patients after coronary artery bypass graft surgery.

## MATERIALS AND METHODS

This randomized control trial was conducted at Department of Cardiac Surgery, Faisalabad Institute of Cardiology Faisalabad from 1<sup>st</sup> June 2019 to 30<sup>th</sup> June 2020. A total of 500 patients were enrolled who were scheduled for coronary artery bypass graft surgery. Preoperative

investigation was carried out in the cardiac surgery ward. Two groups were formed depending upon HbA1c levels. 250 patients having HbA1c levels greater than 7% were included in study group while 250 patients with HbA1c levels of less than 7% were in control group. Postoperative atrial fibrillation (AF), myocardial infarction (MI), stroke, time on ventilator, surgical site infection, hospital stay, in hospital and 30 day mortality were recorded. Patients of both genders and age (25-70years), isolated coronary artery disease and left main disease were included. Patients with known atrial fibrillation (AF), moribund preoperative states, valvular heart diseases, previous cardiac surgery, preoperative history of stroke and preoperative multi-organ disease were excluded.

Surgery was performed using standard techniques of median sternotomy, grafts harvesting, heparinization and standard cannulation to establish standard cardiopulmonary bypass (CPB), cold blood cardioplegia, grafts anastomosis, coronary endarterectomy in diffusely diseased vessels, CPB weaning off, decannulation, drains and pacing wires and chest closure. Left internal mammary artery (LIMA) was used as the conduit to graft LAD while a saphenous vein graft was used for all other coronary vessels. Heparin 100 mg/kg was administered to keep the activated clotting time (ACT) between 200 and 400 sec. Patients were shifted to ICU and their post-operative outcomes were recorded. The data was entered and analyzed through SPSS-26.

## RESULTS

Mean age in control group was 55.19±6.273 while in study group 53.44±6.254. Male ratio in control group was 200 (80%) in study group there were 196 (78.4%). Patients with new onset atrial fibrillation (AF) postoperatively in control group was 25 (10%) while in study group 40 (16%) with p

value (0.062). There was no statistically significance difference in incidence of mortality (p-value 0.020), post-operative myocardial infarction (p value 0.237) and stroke (p-value 0.036). Contrarily there is significantly higher incidence of hospital stay, ventilation time and wound infection (p-value 0.001) in study group as compared to control group (Table 1).

Table 1: Morbidity and mortality in control and study group

Variable	Control group HBA1C<7	Study group HBA1C >7	P value
Age	55.19±6.273 (35–69)	53.44±6.254 (35–69)	0.002
Gender			
Male	200 (80%)	196 (78.4%)	0.741
Female	50 (20%)	54 (21.6%)	
Atrial Fibrillation			
Negative	225 (90%)	210 (84%)	0.062
Positive	25 (10%)	40 (16%)	
Myocardial Infarction			
Negative	229 (91.6%)	220 (88%)	0.237
Positive	21 (8.4%)	30 (12%)	
Hospital stay (days)	5.98±0.703 (5–7)	6.97±1.097 (5–8)	0.001
Ventilation time (hours)	8.35±1.506 (4–12)	13.25±4.078 (6–24)	0.001
Stroke			
Negative	248 (99.2%)	240 (96%)	0.036
Positive	2 (0.8%)	10 (4%)	
Wound Infection			
Negative	225 (90%)	175 (70%)	0.001
Positive	25 (10%)	75 (30%)	
Mortality			
Negative	244 (97.6%)	232 (92.8%)	0.020
Positive	6 (2.4%)	18 (7.2%)	

## DISCUSSION

For over a decade studies have been suggested that patients with diabetes mellitus have increased incidence of developing postoperative morbidity, mortality and recurrence of angina.<sup>16</sup> However, there is increased risk of mortality (16%) in patients who are discovered raised glucose levels after admission in hospital.<sup>17,18</sup> HbA1c independently affects the outcome of patients after CABG. Carson and Colleagues<sup>19</sup> examined large group of patients in which 41663 patients were in diabetic group having 23% to 37% rise in in-hospital morbidity/mortality as compared to 105123 non-diabetic patients. Alserius et al<sup>20</sup> demonstrated increased surgical site infections and decreased 3 year survival in patients while Halkos et al<sup>21</sup> and Narayan et al<sup>3</sup> suggests significant rise in deep sternal wound infections having HbA1c levels greater than 6%. However in terms of hospital mortality and post op myocardial infarction we found no statistical significant results and is consistent with results by Faritous et al<sup>22</sup> and Goksedef et al<sup>23</sup> while Kuhl et al<sup>24</sup> found significant long term results in term of mortality after coronary artery bypass graft surgery. Umpierrez et al<sup>25</sup> showed no significant results in terms of postoperative AF and neurological complication in contrast to hospital stay, time on ventilator and respiratory complication. However, we still agree with the most authors that strict preoperative glycaemic control is mandatory to prevent adverse surgical

outcomes and to improve quality of life after coronary artery bypass graft surgery.

## CONCLUSION

HbA1c levels of <7% is associated with decreased postoperative morbidity or mortality and surgical complications.

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