J Biochem Tech (2019) Special Issue (2): 59-67
ISSN: 0974-2328

Comparing the Duration of Intubation Attempts in Diabetic and Non-Diabetic Patients after Coronary Artery Bypass Grafting

Maryam Zarrizi, Ezzat Paryad*, Atefeh Ghanbari Khanghah, Hamed Faghani

Received: 22 September 2018 / Received in revised form: 15 March 2019, Accepted: 24 March 2019, Published online: 25 April 2019

Abstract

Background and objectives**:**A large number of patients undergoing coronary artery bypass surgery are diabetic patients who have a worse prognosis than non-diabetic patients in the face of treatment intervention. postoperative duration of intubation is one of the important factors in accelerating the patient's recovery process, but it cannot be conclusively expressed about the duration of intubation in diabetic patients.The present study aimed to compare the duration of intubation in diabetic and non-diabetic patients after coronary artery bypass graft surgery in one of the centers of specialization in the heart of the Guilan University of Medical Sciences in Rasht.Materials and methods**:**This is a retrospective study that examined two groups of 356 diabetic and non-diabetic patients after coronary artery bypass graft surgery.The data were collected using patients' medical records and was performed using Chi-square, independent t-test, Mann-Whitney and logistic regression tests.Results**:**The Results showed the mean of the duration of intubation in the diabetic group was 9/60±2/71 and in the non-diabetic group was 10/05±6/29.Based on Chi-square test, history of smoking, history of hypertension,high blood glucose during cardiopulmonary bypass, and according to the Mann-Whitney U arterial oxygen saturation test entering the operating room was significantly different between the two groups.Predictive variables of the duration of intubation in diabetic patients based on logistic regression model include smoking history, receiving anesthesia, body mass index below 25, and range from 25 to 29.9.Conclusion:The duration of intubation in non-diabetic patients was not different from that of diabetic patients after coronary artery bypass graft surgery.

Keywords: Diabetes Mellitus, coronary artery bypass surgery. Mechanical ventilation

Introduction

Currently, coronary artery disease (CAD) is rising across the world as the aging population is growing (Piotto et al., 2012; Thomas & Gaziano, 2012). In this regard, various factors can be assumed to cause CAD including diabetes as one of the major ones. Moreover, an increase in the prevalence rates of diabetes is expected to bring about more cardiovascular diseases (Yahagi et al., 2017; Mohan & Unnikrishnan, 2018; Olesen et al., 2017). Therefore, treatment of CAD considering the amount of arterial involvement and the type of vascular blockers used as well as the underlying factors can include different therapeutic approaches such as drug therapy and invasive interventions for individuals suffering from this heart disease. Surgical interventions are also administered on patients with no controlled CAD symptoms via drug therapy (Vaziri, 2010). Within the surgical treatment of CAD, coronary artery bypass grafting (CABG) has

Maryam Zarrizi

Critical Care Nursing Student , School of Nursing and Midwifery, Guilan University of Medical Sciences, Rasht, Iran

Ezzat Paryad*

Master of nursing, Instructor, Social Determinants of Health Research Center (SDHRC), Department of Nursing (Medical-surgical), School of Nursing and Midwifery, Guilan University of Medical Sciences, Rasht, Iran.

Atefeh Ghanbari Khanghah

Nursing Phd, Associate Professor, Social Determinants of Health Research Center (SDHRC), Department of Nursing, , Guilan University of Medical Science, Rasht, Iran.

Hamed Faghani

Msc. critical care nursing , Dr. heshmat hospital, Guilan University of Medical Sciences, Rasht, Iran

***Email**: E_paryad@gums.ac.ir

been introduced as one of the most common therapeutic choices following the failure of interventions through the skin (Oliveira et al., 2013; Osinaike et al., 2015), which can significantly improve survival and reduce the severity of signs and symptoms common to this disease. After a cardiac surgery, intensive care unit (ICU) admission is similarly regarded as a standard of treatment for most of patients (Shah et al., 2015). So, patients are transferred to ICUs and are connected to ventilators for respiratory support. Gradually, after vigilance and meeting the necessary criteria, ventilator weaning should be performed. In recent years, rapid and early extubation has been considered within 8 hours after surgery because it has been suggested to improve cardiac function, reduce respiratory complications, increase independence and comfort of patient autonomy, and consequently lower workloads of medical personnel (Acosta & Orcasitas, 2016; Faghani et al., 2017). However, prolonged mechanical ventilation is known as a common problem after CABG (Gumos et al., 2015). Thus, identifying different factors related to the duration of intubation attempts can be helpful in terms of providing better health care and shorter presence in ICUs (Pulido, 2017). A large number of patients undergoing CABG are diabetic patients. Such individuals have the worse prognosis when compared with non-diabetics regarding aggressive therapies in a way that the risks of surgery and care before and after these interventions can potentially increase and also mortality and morbidity following cardiac surgery are likely to significantly rise in such patients (Sá et al., 2012; Laiq et al., 2017). In this regard, the results of some studies; for example, the investigation by Yang et al., shed light on the need for prolonged mechanical ventilation in diabetic patients undergoing cardiac surgery (Yong et al., 2018). Nevertheless, Laiq et al. in their study concluded that accurate control of blood glucose during and after cardiac surgery could reduce the duration of mechanical ventilation (Laiq et al., 2017). Moreover; (Mehdizadeh et al., 2014; Faghani et al., 2017; Acosta et al., 2016) found in their studies that the duration of intubation attempts was significantly different between diabetic and non-diabetic patients.Since the duration of post-operative intubation attempts is an important factor accelerating patients' recovery process; it is still not possible to definitely comment on the duration of intubation attempts in diabetic patients undergoing CABG due to the contradictory results of the related studies.Given the high rates of CABG in diabetic patients and considering the fact that the duration of intubation is one of the important and influential factors in the process of recovery, this study was to compare the duration of intubation attempts in diabetic and non-diabetic patients following CABG and also to use the results to plan better care and treatment for patients after CABG.

Methods and Materials

The present study was a retrospective study in which the duration of intubation attempts in diabetic and non-diabetic patients after CABG was compared. This study was part of a larger project in which 1202 cases of patients undergoing CABG were investigated from the 1st of April 2015 to the 1st of August 2017.this study Approved by the Ethics Committee of Vice-Chancellor's Office for Research and Technology at Guilan University of Medical Sciences with code IR.GUMS.REC.1396.281.

The statistical population of this study included patients who had undergone CABG surgery and then had been admitted to the cardiac surgery ICU at Heshmat Educational-Therapeutic Center in the city of Rasht, Iran .Regarding the fact that the sampling was conducted randomly and the regression test was used to analyze the factors related to the duration of intubation attempts, the two study groups were not matched in terms of the intervention variables.

The inclusion criteria were all patients aged over 18 years who had undergone CABG with a cardiopulmonary bypass and without a history of cardiac surgery under pump balloon and requiring surgery on the heart valve or structural repair of the heart during the ICU admission. These individuals did not need to go back to the operating room and receive cardiopulmonary resuscitation (CPR) and re-intubation. The patients examined were also matched in each group in terms of the inclusion criteria. Based on the difference observed in the duration of intubation attempts after CABG in diabetic and non-diabetic patients in the study by (Mehdizadeh et al., 2014), (p=1.66 and p2=2.66), the sample size was calculated using the following formula:

$$\frac{\left(Z_{1-\frac{\alpha}{2}}+Z_{1-\beta}\right)^2\times[P_1(1-P_1)+P_2\ (1-P_2)]}{(P_1-P_2)^2}$$

In this regard, the sample size was determined by 356 individuals in each group with 95% confidence interval (CI) and 80% power of the test. Given that the list of patients who had undergone CABG was available to the researcher including 356 diabetic patients and 356 non-diabetic ones, a systematic random sampling method was used. For this purpose; firstly, patients with diabetes, out of the 1202 cases reviewed, were classified into two separate lists, Then; using the drawing method between one-digit numbers, number 2 was chosen as a regular interval. Employing a randomized method, a sampling method was also applied to both groups.

The research instrument was a questionnaire, developed by the researcher based on an overview of the related texts and books, whose validity was measured by the formal method of assessing validation, so that the validity of this tool was approved by 10 faculty members and nurses working in cardiac ICUs.

Within this three-part questionnaire, the first part was related to demographic characteristics information and variables associated with the disease including age, gender, height, weight, history of smoking and drug abuse, history of drug allergy, history of underlying diseases (hypertension, hyperlipidemia, chronic respiratory disease, and history of arrhythmia), as well as left ventricular ejection fraction (LVEF) prior to the surgery (recorded in the angiography report). The second part included surgical variables including arterial oxygen saturation variables at the end of the cardiopulmonary bypass, amount of arterial oxygen saturation at the entrance to the operating room, length of the aortic cross-clamp, as well as mean level of blood glucose during the pump. In addition, the third part was related to post-operative variables encompassing mean temperature from the arrival to the ICU until the removal of the tracheal tube, mean systolic and diastolic pressure from the time the patients arrived to the ICU until extubation, going through the t-tube placement stage for extubation, use of positive end expiratory pressure (PEEP) via ventilators, and type of sedatives taken during the intubation stage in the ICU. Finally, the duration of the tracheal tube was set to an hour.

The instrument was completed based on patients' medical records, ICU nursing report sheet, and pump report sheet by the perfusionist (cardiopulmonary bypass doctor). The anesthetic process report sheet in the operating room was also completed for each patient. The duration of the intubation attempts included the moment of entering the patient into the ICU considered by an anesthetist before the removal of the tracheal tube. The duration of the intubation lasted for up to 8 hours as a short stay and then it became longer as a long-term stay of the tracheal tube (Jafroudi et al., 2014; Ji et al., 2010).

The collected data were analyzed using the SPSS Statistics (Version 22). For data analysis, the distribution tables and the central indices including mean and dispersion indices (standard deviation: SD) were separately used for the diabetic and non-diabetic groups. In order to address the qualitative variables, Chi-square test was also employed. The Kolmogorov-Smirnov test was correspondingly used to check the normal distribution of the quantitative variables in each group. Moreover; independent t-test and Mann-Whitney U test were respectively used in case of normal and non-normal distribution of the data. Finally, the variables were introduced into the logistic regression model in order to investigate the factors affecting the duration of tracheal tube survival in diabetic patients.

Results

Of the total number of 356 patients in the diabetic and non-diabetic groups, the majority of study samples were male (59% in diabetic and 77.2% in non-diabetic groups). Most of the samples also did not have a history of smoking and drug abuse as well as drug allergy. The bulk of patients in both groups suffered from hypertension (82.3% in diabetics and 66% in non-diabetics). The level of blood glucose on the pump in most diabetic patients (59.3%) was higher than the mean and this value in the majority of non-diabetics (65.4%) was lower than the mean. The mean and the SD of the age in the diabetic group were 8.8±59.73 years and these values were 60.71±8.99 years in the non-diabetic group. As well, the mean and the SD of the body mass index (BMI) in the diabetic group were equal to 27.17±4.03 and they were 26.87±4.7 in the non-diabetic group. Moreover, the mean and the SD of the duration of stay in ICUs in the diabetic group were also reported by 9.60±2.71 and these values were by 10.05±6.29 in the non-diabetic group.

Based on the results of the Chi-square test ($p<0.0001$), history of smoking ($p<0.0001$), history of hypertension ($p<0.0001$), hyperlipidemia ($p<0.0001$), and levels blood glucose on pump ($p<0.0001$) and according to the findings of the Mann-Whitney U test, the entrance to the operating room ($p<0.0001$) was significantly different between the two study groups (Table 1).
The mean and the SD of the duration of intubation attempts was by 9.82±4.85 hours in all patients and the duration of the tracheal tube was higher than the mean value in the majority of samples in the diabetics (62.9%) and non-diabetics (58.4%).
Furthermore, there was no statistically significant difference in the duration of intubation attempts in diabetic and non-diabetic patients (Table 2).
Predictor variables in this study were considered as the duration of intubation attempts following cardiac surgery in diabetic patients based on logistic regression model including history of smoking (95% CI, $p=0.001$, $\beta=1.035$) and receiving anesthesia (95% CI, BMI under 25 ($p=0.032$, $\beta=-0.64$, 95% CI). The BMI also ranged from 25 to 29.9 ($p=0.002$, $\beta=-1.11$, 95% CI) (Table 3).

Discussion

Based on the results of the present study, the duration of intubation attempts in non-diabetic patients was not reported different from that of diabetics following CABG. In the study by (Koochemeshki et al., 2013), the effects of diabetes mellitus on mortality and short-term complications after CABG was also compared among diabetic and non-diabetic patients and no significant difference was found in terms of the duration of mechanical ventilation. In addition, (Faritous et al., 2014), in their study, reported no significant difference between diabetic and non-diabetic groups whereas the results of the meta-analysis by (Haga et al., 2011) examining the effects of precise control of levels of blood glucose during and after surgery on mortality and morbidity were found to significantly reduce the duration of mechanical ventilation in a group with blood glucose and they were shown to be controlled. Thus, the results of the present study were different from those of some similar investigations.

It seems that blood glucose by itself cannot determine the duration of intubation attempts after cardiac surgery. Considering that open-heart surgery and cardiopulmonary bypass are likely to influence many body systems, it is assumed that numerous interventional factors can be effective on this variable because two groups of diabetic and non-diabetic individuals were compared in the present study in terms of the length of the tracheal tube placement along with other variables. According to the random sampling in this study, the presence of each of these variables might influence factors affecting the duration of the tracheal tube stay in each of these groups.

The variables examined included gender, history of smoking and drug abuse, hypertension, hyperlipidemia, and arterial blood oxygen saturation at the moment of entering the operating room, and the blood glucose measured during the cardiopulmonary bypass that was reported different between the two study groups. Given that diabetes with complications of small arteries could affect the use of cardiopulmonary pump during open-heart surgery, diabetic patients were expected to be in need of longer durations of the endotracheal tube attempts; however, the results of the present study did not support this hypothesis.

Individuals' gender could be also another influential factor, since in both groups; men constituted the majority of the study samples. Given the fact that men have more muscle mass than women, this volume as well as muscle strength could also influence respiratory capacity and cause more effective and efficient breathing for extubation. Therefore, the duration of intubation was not affected. Certainly, in the study by (Gumos et al., 2015) examining long-term mechanical ventilation after cardiac surgery, no statistically significant difference was reported between the two groups in terms of gender. However, the results of the investigation by Miskowiec evaluating the independent predictors of early mortality after CABG showed that women were more likely to have diabetes than men and also undergo longer duration of intubation attempts(Miśkowiec et al., 2015). On the other hand, the history of smoking and drug abuse could be a factor affecting the duration of intubation in smokers and those consuming narcotics by inhalation because respiratory capacity can be reduced, the volume of dead respiratory space can be increased, and the activity of the celiac disease can be ceased. Mucosal secretions and sputum can be consequently produced and all of these events are likely to delay extubation. Although smokers gain more effective and deep breathing after the surgery, they might later remain under their influence. Among individuals with hypertension or hyperlipidemia, vascular elasticity can be lost, so it can cause blood flow to vital organs including the lungs to undergo changes and to have weaker performance. What is of utmost importance for patients to be extubed is a strong and effective respiratory muscle function. However; in (Piotto et al., 2012), studying independent predictors after CABG, a history of hypertension and hyperlipidemia had not been associated with longer mechanical ventilation. The levels of blood glucose measured during the cardiopulmonary bypass were also reported to be different in both study groups because the levels of fasting blood glucose were definitely various in diabetic and non-diabetic patients. Moreover, the cardioplegia solution of Dextrose and Ringer's serum and the primary cardiopulmonary bypass were used. Because of blood clotting with each of these solutions, the levels of blood glucose had also increased at different stages of the surgery. The effects of blood glucose at any stage could be different. As cited by Faritous et al., mechanical ventilation in two groups of hemoglobin A1c was less than 7 and not more than 7 according to hemoglobin A1c levels; but, based on the levels of fasting blood glucose in two group of less than 126 mg/dl and greater than 126, they had a significant difference in terms of the duration of mechanical ventilation (Faritous et al., 2014). In addition, it should be noted that open-heart surgery can be a great body stress affecting patients' immune system as well as the levels of blood glucose in patients when placed on cardiopulmonary bypass.

Considering that each of these variables could affect the process of disconnection of the patients from the ventilator, the significant variables were entered into the regression model in order to evaluate the predictive impacts of each of these factors on the duration of intubation attempts in diabetic patients. In the final model; history of smoking, receiving anesthesia in ICUs, as well as BMI below 25 and between 25 and 29.99 were identified as predictors of the duration of intubation in patients with diabetes.

As mentioned above, in individuals with a history of smoking, the duration of intubation attempts was reported to be longer. In the study by (Farhad Malek et al., 2010), lung functioning was also reported to be impaired in diabetic patients and a significant increase in the FEV1/FVC ratio (Tiffeneau-Pinelli index) suggested a restrictive pattern for a pulmonary diabetes mellitus. Therefore, it is expected that pulmonary function for spontaneous respiratory after cardiac surgery can become weaker in smokers with diabetes which would result in longer mechanical ventilation. However, in the study by Piotto et al. and Faghani et al, no statistically significant relationship was found between history of smoking and duration of tracheal tube survival (Piotto et al., 2012; Faghani et al., 2017). In another study by Qiang Ji et al., a comparison between smokers and non-smokers undergoing cardiac surgery showed that the smokers had a higher incidence of post-operative pulmonary complications and a longer mechanical ventilation time. In comparison with non-smokers and those having a history of smoking in the past, there was no significant difference in the duration of mechanical ventilation (Ji et al., 2010). Perhaps, the given difference in the results was due to the fact that the non-emergency patients undergoing CABG had been given an opportunity to quit smoking to prior to the surgery in many of the treatment centers. This could lead to some improvements in the pathological changes resulting from smoking albeit it was irreversible. In the present study, smokers had often given up smoking from the day they had been admitted and became candidates for surgery which was likely to affect the results. The undesirable effects of smoking on respiratory parameters of the individuals also remained valid hours and days after the surgery.

The given study also revealed that the duration of ventilation prolonged in patients who had received sedation before the process of extubation compared with those who had not taken any medications. It seemed that receiving sedation and extubation were inextricably correlated. However, receiving sedatives had no effect on early extubation in the study by (Hetland et al., 2017), which was not in line with the findings of the present study. This discrepancy could be due to the simultaneous use of several sedative drugs according to an anesthetist's order which was likely to increase the use of drugs, augment the effect of the drug, reduce the chance of spontaneous breathing, and consequently affect the duration of intubation. The investigation by (Klompas et al., 2016) evaluating the impact of different sedative drugs on the incidence of complications in patients undergoing mechanical ventilation also demonstrated that such medications could shape the duration of intubation which was consistent with the results of the present study.

Open-heart surgery is often performed using Median sternotomy. Patients also experience severe post-operative pains and as they wake up they begin to fight with a ventilator and an endotracheal tube. These conditions can affect patients' blood pressure and then cause unplanned surgical changes. Therefore, all patients receive sedatives after cardiac surgery. Obviously, the impact of these drugs on diabetic and non-diabetic patients can be distinguished due to the effect of diabetes on ending vessel functions with its final impact on the duration of intubation.

One other factor influencing mechanical ventilation in diabetic patients was the BMI. In the study by (Abdullah et al., 2017), no significant difference was reported between the two groups of patients with low and high BMIs in terms of mechanical ventilation time after cardiac surgery. Also, (Costa et al., 2015) concluded that there was no significant relationship between BMI and duration of mechanical ventilation.(Devarajan et al., 2016) investigating the relationship between BMI and post-CABG found that class 1, 2, and 3 obese individuals were more likely to have lung complications. On the other hand, (mehdizade et al., 2014) argued that the increase in BMI could lessen the duration of intubation after CABG. These contradictory results in various studies could be due to the effects of other factors and underlying conditions of patients, since individuals with high and low BMIs could be often infected with other underlying illnesses which might influence the duration of mechanical ventilation. Furthermore; it should be reminded that there is a risk of airway obstruction due to the position of the neck and its muscles in obese people especially after surgery and during anesthesia as the muscles are relaxed, so complete spontaneous breathing can cause the use of prolonged mechanical ventilation for these patients. Considering high power and muscular strength, these people are also endowed with high respiratory capacity which can lead to a controversial role of body mass on the duration of mechanical ventilation that can also have an influential role in patients with diabetes. It seemed that there was no statistically significant difference between the individuals with and without diabetes in terms of all the variables affecting the duration of endotracheal intubation. Therefore, more accurate results are needed to be obtained regarding the possible relationship between diabetes and duration of intubation following open-heart surgery. The inadequacy of the groups compared in this study was also highlighted as a limitation. Due to the fact that the extubation of the tracheal tube was performed based on an anesthetist's order and the study samples were under the monitoring of different anesthesia specialists, each of these factors could affect the duration of the tracheal intubation which could be considered as another limitation of this study.

Considering the fact that the data in this study was based on reports from patients' medical records, they could not be accurate in all cases. Accordingly, it was recommended to use cross-sectional or prospective studies to determine the complications of cardiac surgery and in particular the duration of intubation with respect to the significant number of patients undergoing CABG.

Since diabetic patients are more likely to develop post-operative complications due to the nature of their illness, examining the factors associated with the duration of intubation after surgery could also provide valuable information that are of importance for better care provided to these patients.

In conclusion The duration of intubation in non-diabetic patients was not different from that of diabetic patients after coronary artery bypass graft surgery. Given the results obtained in this study, it was suggested to shed light on other variables affecting the duration of mechanical ventilation survival at the time of admitting diabetic patients for CABG if necessary. So, the removal or modification of such variables could make nursing care better and more efficient.

Acknowledgment

The present study was adopted from a Master's Thesis in Intensive and Critical Care Nursing. The authors of this article, hereby, appreciate the Vice-Chancellor's Office for Research and Technology at Guilan University of Medical Sciences for funding this study as an approved project with the code no. 96071507 and they also express their gratitude to the staff of cardiac ICU at Heshmat Educational-Therapeutic Center in the city of Rasht who provided the opportunity to do this research.

Reference:

Abdallah AG, Elnewihy MA, Brik AI, Salem AMM. Impact of obesity on early cardiac surgical outcomes in Egypt: Early outcomes of coronary artery bypass graft surgery. Journal of the Egyptian Society of Cardio-Thoracic Surgery. 2017;25(3):192-7.

Acosta JJS, Orcasitas JF. Predictors of prolonged mechanical ventilation after coronary artery bypass grafting among Filipino adults with coronary artery disease. SPMC Journal of Health Care Services. 2016;2(1).

Costa VEA, Ferolla SM, Reis TOd, Rabello RR, Rocha EAV, Couto CMF, et al. Impact of body mass index on outcome in patients undergoing coronary artery bypass grafting and/or valve replacement surgery. Brazilian Journal of Cardiovascular Surgery. 2015;30(3):335-42.

Devarajan J, Vydyanathan A, You J, Xu M, Sessler DI, Sabik JF, et al. The association between body mass index and outcome after coronary artery bypass grafting operations. European Journal of Cardio-Thoracic Surgery. 2016;50(2):344-9

Faghani H, Mosavinasab N, Gholipour Baradari A, Moosazadeh M, Kheradmand M, Esmaeili R. Duration of Intubation after Coronary Artery Bypass Graft Surgery and Its Related Factors. Journal of Mazandaran University of Medical Sciences. 2017;26(146):68-79.

Faritous Z, Ardeshiri M, Yazdanian F, Jalali A, Totonchi Z, Azarfarin R. Hyperglycemia or high hemoglobin A1C: which one is more associated with morbidity and mortality after coronary artery bypass graft surgery? Annals of Thoracic and Cardiovascular Surgery. 2014;20(3):223-8.

Gumus F, Polat A, Yektas A, Totoz T, Bagci M, Erentug V, et al. Prolonged mechanical ventilation after CABG: risk factor analysis. Journal of cardiothoracic and vascular anesthesia. 2015;29(1):52-8.

Haga KK, McClymont KL, Clarke S, Grounds RS, Ng KYB, Glyde DW, et al. The effect of tight glycaemic control, during and after cardiac surgery, on patient mortality and morbidity: A systematic review and meta-analysis. Journal of cardiothoracic surgery. 2011;6(1):3.

Hetland B, Lindquist R, Weinert CR, Peden-McAlpine C, Savik K, Chlan L. Predictive associations of music, anxiety, and sedative exposure on mechanical ventilation weaning trials. American Journal of Critical Care. 2017;26(3):210-20.

Inwood HL. Adult cardiac surgery: nursing care and management: Whurr; 2002.

Jafroudi S, Mehdizadeh Attar M, Farmanbar R, Kazem Nejad Leili E, Paryad E. Predictors' issues of intubation time after coronary artery bypass graft surgery. Journal of Holistic Nursing And Midwifery. 2014;24(4):20-9.

Ji Q, Chi L, Mei Y, Wang X, Feng J, Cai J, et al. Risk factors for late extubation after coronary artery bypass grafting. Heart & Lung: The Journal of Acute and Critical Care. 2010;39(4):275-82.

Klompas M, Li L, Szumita P, Kleinman K, Murphy MV. Associations between different sedatives and ventilator-associated events, length of stay, and mortality in patients who were mechanically ventilated. Chest. 2016;149(6):1373-9.

Koochemeshki V, Salmanzadeh HR, Sayyadi H, Amestejani M, Ardabili SS. The effect of diabetes mellitus on short term mortality and morbidity after isolated coronary artery bypass grafting surgery. International cardiovascular research journal. 2013;7(2):41.

Laiq N, Khan S, Khan Mn. Controlled Blood Sugar in Perioperative Period, Reduces Length of Stay in Cardiac Icu. Kjms. 2017;10(1):39.

Malek F, Malek M, Tosi J, Soltabi S, Hashemi H. Comparison of Pulmonary Function in Diabetic Patients with and Without Retinopathy Compared with Control Group. Iranian Journal of Endocrinology and Metabolism. 2010;11(2):143-50.

Miśkowiec DŁ, Walczak A, Jaszewski R, Marcinkiewicz A, Ostrowski S. Independent predictors of early mortality after coronary artery bypass grafting in a single centre experience—does gender matter? Kardiologia Polska (Polish Heart Journal). 2015;73(2):109-17.

Mohan V, Unnikrishnan R. World Clinics: Diabetology - Complications of Diabetes, Volume 2, Number 1: Jaypee Brothers,Medical Publishers Pvt. Limited; 2018.

Olesen KK, Madsen M, Egholm G, Thim T, Jensen LO, Raungaard B, et al. Patients With Diabetes Without Significant Angiographic Coronary Artery Disease Have the Same Risk of Myocardial Infarction as Patients Without Diabetes in a Real-World Population Receiving Appropriate Prophylactic Treatment. Diabetes care. 2017;40(8):1103-10.

Oliveira EKd, Turquetto ALR, Tauil PL, Junqueira Jr LF, Porto LGG. Risk factors for prolonged hospital stay after isolated coronary artery bypass grafting. Brazilian Journal of Cardiovascular Surgery. 2013;28(3):353-63.

Osinaike BB, Okikiolu B, Olusesin O. Prolonged intensive care unit stay after coronary artery bypass graft surgery: Role of perioperative factors. Nigerian Postgraduate Medical Journal. 2015;22(4):213.

Piotto RF, Ferreira FB, Colósimo FC, Silva GSd, Sousa AGd, Braile DM. Independent predictors of prolonged mechanical ventilation after coronary artery bypass surgery. Brazilian Journal of Cardiovascular Surgery. 2012;27(4):520-8.

Pulido JN. Prediction of prolonged mechanical ventilation after cardiac surgery: An imperfect crystal ball. The Journal of thoracic and cardiovascular surgery. 2017;153(1):116-7.

Sá, M. P. B. D. O., Soares, E. F., Santos, C. A., Figueiredo, O. J., Lima, R. O. A., Escobar, R. R., ... & Lima, R. D. C. (2012). Perioperative mortality in diabetic patients undergoing coronary artery bypass graft surgery. Revista do Colégio Brasileiro de Cirurgiões, 39(1), 22-27.

Shah R, Patel R, Sharma R, Pandya H, Shah K. FACTORS INFLUENCING PROLONGED STAY IN THE INTENSIVE CARE UNIT AFTER CARDIAC SURGERY. National Journal of Medical Research. 2015;5(2):140-4.

Thomas A, Gaziano J. Epidemiology of cardiovascular disease: Harrison's principles of internal medicine. 18 ed. New York: McGraw-Hill; 2012.

Vaziri M. Schwartzs principles of surgery. Tehran: Arjmand; 2010.

Yahagi K, Kolodgie FD, Lutter C, Mori H, Romero ME, Finn AV, et al. Pathology of Human Coronary and Carotid Artery Atherosclerosis and Vascular Calcification in Diabetes MellitusHighlights. Arteriosclerosis, thrombosis, and vascular biology. 2017;37(2):191-204.

Yong PH, Weinberg L, Torkamani N, Churilov L, Robbins RJ, Ma R, et al. The Presence of Diabetes and Higher HbA1c Are Independently Associated With Adverse Outcomes After Surgery. Diabetes care. 2018:dc172304.

Table 1: A single-variable analysis of demographic characteristics in diabetic and non diabetic groups and a significant level

Qualitative variables \ Grups		diabetic	Non diabetic	Test and judgment
		N(%)	N(%)	
sex	Male	210(59%)	275(77/2%)	χ^2 =27.32* P<0.0001
	female	146(41%)	81(22/8%)	
Smoker	yes	82(23%)	133(37/4%)	χ^2 =17.33* p<0.0001
	no	274(77%)	223(62/6%)	
opium	yes	57(16%)	78(21/9%)	χ^2=4.03* p=0.045
	no	299(84%)	278(78/1%)	
Drug sensivity	yes	23(6/5%)	20(5/6%)	χ^2 =0.223* p=0.637
	no	333(93/5%)	336(94/4%)	
HTN	yes	293(82/3%)	235(66%)	χ^2 =24.654* p<0.0001
	no	63(17/7%)	121(34%)	
HLP	yes	264(74/2%)	200(56/2%)	χ^2 =25.344* p<0.0001
	no	92(25/8%)	156(43/8%)	
COPD***	yes	5(1/4%)	3(0/8%)	χ^2 =0.506* p=0.477
	no	351(98/6%)	353(99/2%)	
arrhythmia	yes	5(1/4%)	6(1/7%)	χ^2 = 0.092* p=0.761
	no	351(98/6%)	350(98/3%)	
BS on pump****	≤243	145(40/7%)	233(65/4%)	χ^2 = 43.672* p<0.0001
	>243	211(59/3%)	123(34/6%)	
t-tube	yes	252(70/8%)	259(72/8%)	χ^2 =0.340* p=0.560
	no	104(29/2%)	97(27/2%)	
Peep	yes	331(93%)	325(91/3%)	χ^2 =0.698* p=0.404
	no	25(7%)	31(8/7%)	
sedation	yes	352(98/9%)	350(98/3%)	χ^2 =0.406* p=0.524
	no	4(1/1%)	6(1/7%)	
Quantitative variables \ Grups		diabetic	Non diabetic	Test and judgment
		Mean ±SD	Mean ±SD	
age		59.73±8.38	60.71±8.99	P=0.147**
height		163.98±8.89	156.18±8.08	P<0.0001**
weight		27.17±4.03	26.80±4.07	P=0.968**
BMI		72.98±11.38	73.16±12.40	P<0.0001**
Ejection fraction		44.36±10.53	44.83±9.38	P=0.866**
O2 Saturation pump		99.86±0.14	99.87±0.10	P=0.084**
Primary O2 Saturation		99.74±0.23	99.79±0.19	P<0.0001**
Cross clamp time		36.57±9.9	35.60±11.11	P=0.032**
Systolic pressure mean		110.11±10.04	110.42±10.48	P=0.625**
Diastolic pressure mean		60.34±8.01	60.89±8.12	P=0.403**
Intube time		576.13±162.87	603.40±377.76	P=0.296**

*chi-square test

**mann-whitney U test

***Chronic obstructive pulmonary disease

* ***blood sugar

Table 2: The duration of intubation in diabetic and non-diabetic patients

Intube time / grups	<590 min	≥590 min	TEST
	N(%)	N(%)	
Diabetic	132(37/1%)	224(62/9%)	P=0.296*
Non diabetic	148(41/6%)	208(58/4%)	

* mann-whitney U test

Table 3: Predictive variables Duration of intubation after cardiac surgery in diabetic patients based on logistic regression model

Variable	β	standard error (SE)	wald	df	P value	Exp (B)	Confidence interval 95 %
SMOKER	1.035	0.340	10.243	1	0.001	1.035	1.524-5.777
SEDATION	-2.450	1.234	3.941	1	0.047	-2.450	0.008-0.969
BMI			10.055	2	0.007		
BMI<25kg/m^2	-0.645	0.300	4.607	1	0.032	-0.645	0.291-0.946
BMI25-29.9kg/m^2	-1.118	0.355	9.922	1	0.002	-1.118	0.163-0.655