

Effect of Body Mass Index on patients prognosis after heart surgery

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Original Article

Abstract

Introduction: Patients with high or low body mass index may be more at risk of death and complications after surgery, especially in patients who have coronary artery bypass grafting may be the outcome could be more specific, so we decided to evaluate effect BMI and its correlation with survival and outcome in cardiac surgery.

Methods: A Cross sectional study of 345 patients who underwent surgery from 2010 till 2013 coronary artery bypass grafts were performed in our center. Each of the patients was monitored for a year. Patient information was collected. Then in terms of body mass index and its impact on patient outcomes after surgery were studied.

Results: Among patients with low body mass index (BMI < 20), patients with a high body mass index (BMI > 30) as well as patients with normal body mass index were not significantly associated with mortality after surgery. Most obese patients were at risk of postoperative MI (P=0.02). Pneumonia after surgery in patients with high body mass index than patients with a normal body mass index and were more common in lean subjects (P=0.023).

Conclusion: In our study we find that high or low BMI alone increased mortality after cardiac surgery is not. Also, obese people are at higher risk of postoperative complications.

Key words: Body Mass Index, Coronary Artery, Outcome

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Introduction:

Coronary artery disease is the most common cardiac pathology that cardiovascular surgeons deal with it. The etiology of coronary artery disease is basically atherosclerosis. It is a multifactorial disease and the main risk factors are hyperlipidemia, smoking, diabetes, high blood pressure, obesity, sedentary lifestyle and male gender. CABG has indications in patients with chronic stable angina, unstable angina and angina

after infarction or ischemia in patients with unusual symptoms that are easily triggered during stress test. MI is bleeding, arrhythmias, cardiac tamponade, wound infection, pneumonia, respiratory failure, renal failure, GI complications, and failure perioperative complications during surgery. Exercise capacity usually improves significantly, so that more patients after CABG clearly show better yield response to exercise due to improved blood flow. This improves performance

up to 10 years and in patients receiving IMA grafts have been longer recovery. Long-term survival after CABG is so great that more than 5-year survival is more than 90% and 10-year survival is 75% to 90% depending on comorbidities. New medical treatments for diabetes, hypercholesterolemia, hypertension and smoking cessation improves long-term survival significantly. According to the data available in the database STS (Society of Thoracic Surgeons), the risk of mortality associated with CABG surgery alone is 1.9% and if associated with the risk of death by heavy toll rises to 15%. The risk of bleeding requires reoperation increases 1.8% the risk of MI after 0.9% and increases 1.6% the probability of any neurological complications including coma, stroke, palsy, and TIA.

There is 1.1% Risk for permanent stroke. Coronary bypass graft surgery treatment strategy is excellent for myocardial ischemia. As people get older, age-related diseases also increases the risk of treatment. Selected new techniques and effectively reduce the complications and mortality after surgery. Alternative methods such as the use of off-pump CABG and PCI follow this path. There are, however, the best treatment for vascular disease corner is CABG stated with cardiopulmonary bypass now (1-3).

Dr. Engeiman et al state that a low BMI and Hypoalbuminemia both increased mortality and postoperative complications after heart surgery. The thinnest patients have the most risk factors for after surgery complications (4). In some studies, it is stated that BMI has significant effect on hospitalization time of patients in ICU and surgery rooms so that fat patients have less hospitalization time in ICU than patients with normal BMI and fatness doesn't influence on fertility by surgery and also other complications in comparison to normal weights (5,6). Some believe that patients with low BMI should significantly be noticed in heart surgery, because they have greatly related with miserable consequences after surgery (7-9). Dr. Habib et al in their study concluded that high distortion than normal BMI specially its high values directly increase morbidities and long term survival get worst (10). Intensive fatness (BMI>40) is directly related to miserable consequences. In addition, it increases hospitalization time after

CABG surgery (11-14). In contrary, some believed that fat patients have better hospital outcomes than patients with normal BMI and have higher survival than patients with heart surgery. Low BMI increases fertility and low albumin serum increase infection risk after surgery (15).

Methods:

Study was conducted in cross-sectional and descriptive- analytical form on patients since June 2009 till August 2012 who were operated by pass in Jorjani hear surgery center of Bandarabbas Shahid Mohammadi Hospital for 38 months. Coronary artery bypass (CABG) was conducted using the left internal mammary artery (LIMA) and saphenous vein Grafts with cardiopulmonary bypass (CPB).

First, patient data including age, gender, place of birth, residence, height and weight as well as laboratory data entry hospitalization and presence of risk factors that could result (outcome) of the disease affect were collected through the records, books and other information resources related to patients. Subsequently, patients to assess the physical condition and complications after surgery were monitored for one year. The number of patients who could not gain access to them was excluded from the final calculation. According to BMI, patients were classified in the three groups, with a low BMI (<20kg/m²), BMI within the normal range (20-300 kg/m²) and high BMI (< 30 kg/m²).

Data was analyzed using statistical software spss 20 and chi-square test (chi-square) to examine relationships between variables. P<0.05 was considered as significant level.

Results:

345 patients were examined in this study all of whom were under coronary bypass graft surgery (CABG). 58% (203) were male, and 42% (142) were female.

The average age of these people is 60.7 years; the minimum age is 30 years and maximum is 86 years. 16.4% are under 50 years old, 73.4% are between 50 and 75 years, and 10.2% of them are over 75 years. These people weights are in average of 34 to 110kg with an average weight 61kg.

Body mass index (BMI) of them was between a minimum of 13.48 to a maximum of 43 kg with an average of 23 kg/m². 21.5% BMI is less than 20

kg/m², 52.8% BMI is between 20 and 25 kg/m², 20% BMI is between 25 and 30 kg/m², and 5.7% BMI is more than 30 kg/m².

Table 3-1. The percentage of patients according to demographic parameters, blood groups, and its relationship with different levels of BMI (BMI) and mortality

	BMI (kg/m ²)			P	Operative death		
	<20	20-30	>30		Yes	No	P
Demography Gender				0.04			0.83
Percent female	15.2	76.1	8.7		6.3	93.7	
Percent male	22.7	73.7	3.5		5.7	94.3	
Percent age(y)				0.006			0.37
<50	2.6	84.2	13.2		4	96	
50-75	20.7	73.9	5.4		5	95	
>75	31.4	68.6	0.0		11.5	88.5	
BMI (kg/m²)							0.20
Percent thin (<20)					8.3	91.7	
Percent 20-30					4.9	95.1	
Percent obese (>30)					16.7	83.3	
Serum albumin (g/dl)				0.21			0.001
Percent <2.5	0.0	100	0.0		0.0	100	
Percent 2.5-3.5	27.1	68.8	4.2		12.7	87.3	
Percent >3.5	15.2	78.7	6.1		0.0	100	

Table 3-2. Occurrence probability and complications associated with BMI levels in patients after CABG surgery

	BMI (kg/m ²)			P
	<20	20-30	>30	
Re-exploration for bleeding	22.7	16.7	21.1	0.502
Deep sternal wound infection	0.0	1.2	0.0	0.599
Leg infection	1.5	0.4	0.0	0.543
CVA/TIA	0.0	0.4	0.0	0.844
MI	0.0	0.4	5.3	0.023
Low cardiac output	1.5	1.6	0.0	0.858
Pneumonia	0.0	0.4	5.3	0.023
Sepsis	0.0	0.4	0.0	0.844
ICU>3 days	81.8	82.1	73.7	0.66
Ventilatory support >1 day	22.7	19.1	15.8	0.734
Length of stay >10 days	31.8	23.1	36.8	0.181
Operative death	8.3	4.9	16.7	0.198

Low BMI (>20 kg/m²) was seen in 15.2% of women and 22.7% of men. On other hand, high BMI (<30 kg/m²) was seen in 8.7% of women and 3.5% of men. According to P=0.04, it can be claimed that there is acceptable relationship between BMI and gender. There was no significant relationship between gender and mortality (P=0.83) (Table 3.1)

31.4% of patients are over 75 years old have low BMI (<20kg/m²) whereas 2.6% of patients had a low BMI under 50 years old. 13.2% of those under age 50 and 5.4% of patients were 50 to 70 years old had high BMI (<30 kg/m²). No patient over 75 years old had high BMI. P=0.004 strongly suggests that the BMI is related to age. However, BMI is extremely impressed by age and reduce.

There was no significant relationship between age and mortality rates ($P=0.37$) (Table 3.1).

51% of people with low BMI and 28.6% of people with high BMI have low serum albumin (3.5-2.5g/dl), while 71.4% of them with high BMI and 49% of them with low BMI have serum albumin levels greater than 3.5g/dl, yet there wasn't significant association between BMI and serum albumin level was ($P=0.21$) (Table 3.1).

16.7% of people with high BMI and 8.3% of them with low BMI and also 4.9% of them with BMI between 30-20kg/m² were died shortly during or after surgery. But the relationship is not statistically significant ($P=0.20$) (Table 3.1).

32% of patients with low serum albumin (3.5-2.5g/dl) needed reoperation because of bleeding while only 12.9% of patients with normal serum albumin (levels >3.5g/dl) needed this action. According to $P<0.001$ and odds ratio=3.31, there is positive and significant relationship about the effects of reducing normal levels of serum albumin on increase in the incidence of subsequent re-bleeding requiring surgery (Table 3-2).

22.7% of patients with low BMI (<20kg/m²) and 21.1% of patients with high BMI (>30kg/m²) needed subsequent surgery after re-bleeding. Since $P=0.50$, no significant relationship was seen. (Table 3-2) there was no significant relationship between BMI and serum albumin level in patients with CABG post-operative complications such as infection and deep sternal region, leg infection, CVA/TIA, Low cardiac output and Sepsis also need to be admitted to the ICU more than 3 day. (Table 3-2).

5.3% of patients with high BMI (>30kg/m²) were infected to MI and pneumonia after surgery while none of the patients with low BMI (<20 kg/m²) had these side effects. According to $P=0.02$, there is a significant relationship. (Table 3-2).

8.3% of patients with low BMI (<20 kg/m²) and 16.7% of patients with high BMI (>30 kg/m²) had died during or after the action. However, the relationship between them is not significant. (Table 3-2).

Conclusion:

The youngest age of patients in the study coronary artery bypass graft (CABG) was 30 years old. The mean age of studied people was 60.7 years that is lower comparing to other studies that have been done in this. (For example, the average age 70.4 years in one study)

In this study, women were significantly fatter than men. On the other hand, Men were the majority of thin people. Similarly, mortality resulted by CABG surgery was not influenced by gender.

Older age had a clear relationship with BMI, so that older people make the majority of thin patients. However, age alone is not a risk factor for increasing mortality after cardiac surgery. But the simultaneous presence of other risk factors is needed for increasing morbidity and mortality.

Fat patients (BMI >30 kg/m²) are at a higher risk for MI after CABG surgery compared to patients with low BMI (<20kg/m²) which can increase the postoperative mortality and adverse consequences.

This study showed that the risk of pneumonia increases after CABG surgery in fat patients. However, patients with a low BMI are less likely to develop the condition.

In this study, no evidence was found about direct impact of BMI down or up on the other postoperative complications including prolonged hospital stay or need to be hospitalized in the intensive care unit longer, sepsis, low cardiac output, stroke, infection action and the need for reoperation due to bleeding.

In this study, patients with low serum albumin (1.5-3.5g/dl) are exposed to higher risk of dying after heart surgery. In addition, these patients are exposed to the higher risk of re-bleeding requiring surgery after surgery, CABG.

Low serum albumin is an independent risk factor which increases the need for mechanical ventilation for more than 1 day after CABG surgery despite its correction before surgery.

In spite of other studies about either low or high BMI, none of them increase mortality after heart CABG surgery alone. Nonetheless, presence with other risk factors simultaneously increases the morbidity and mortality after surgery.

Patients with high BMI are exposed to more complications after heart surgery than patients with low BMI and have worse outcomes.

We assure to find more valuable information by more studies in this field. In addition, better strategies will be found to reduce mortality and other complications after surgery.

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