

ORIGINAL ARTICLE

Association of Obesity with Increased Rate of Postoperative Superficial Sternal Wound Infection after Coronary Artery Bypass Grafting Surgery

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Obesity is a common and rising health problem; almost one fourth of Pakistani population is classified as obese.¹ Obesity is a well-known risk factor for the development of diabetes, high blood pressure, and ischemic heart disease. It is also known to be a risk factor for intra-operative morbidity and mortality in heart surgery.²

The body mass index (BMI) is a measurement of a person's nutritional health, metabolic irregularities, and basic organ performance. Obesity's role in individuals undergoing heart surgery, however, is unknown.³ The data showing the effect of obesity on postoperative outcome are controversial: many studies showed no considerable correlation between increased BMI with respect to morbidity and death after cardiac surgery although in some studies obesity was related with postoperative wound infection.⁴

Obesity is defined as BMI \geq 30 kg/m², normal weight $<$ 25 kg/m². Terada et al. conducted research at severe obesity and its link to an increased risk of early infection, finding that the early infection rate was 7.9%, compared to a cumulative rate of 24.0 % among obese patients, and concluded that obesity was an independent risk factor for a longer stay in the hospital, with infection being a potentially preventable risk factor. Increased intra-operative attention and therapy to reduce the risks of infection and duration of stay in the hospital in obese patients may improve the quality and efficiency of patient care.⁵

Deep sternal wound infection after sternotomy is a serious complication of cardiac surgery involving deep retrosternal tissue and mediastinal fascia (DSWI, also referred to as mediastinitis).⁶ In a recent series of reports, the prevalence of DSWI has been stated to be between 0.6 and 5 percent. DSWI results in longer hospital stays and higher costs, despite adequate surgical and medical treatment, with associated mortality ranging from 10% to 47%.⁷

The purpose of this research was to document the effect of obesity on postoperative results after CABG surgery and compare the results in obese and normal weight patients developing the effects of improvements in cardiac surgery and post-operative

care. It would bring to develop patient management guidelines for CABG in obese group to minimize risk of infection in this group.

MATERIAL AND METHODS

This was a prospective Comparative Study, conducted at the Cardiac Surgery Department, PIC, Jail Road, Lahore from 1st July 2020 to 31st Dec 2020. Non probability / purposive sampling technique was used. 140 patients (70 in each group) enrolled in this study.

Operational Definition: Post operative Superficial Sternal Wound Infection (SSWI) is defined as an infection involving only skin or subcutaneous tissue at the incision site.

Inclusion Criteria

- Patients undergoing on pump coronary artery bypass surgery
- Both Gender with age range 30-70 years.
- Patients with coronary artery disease.

Exclusion Criteria

- Patients undergoing emergency CABG and valve surgery.
- Patients with co-morbidities (such as renal dysfunction Cr $>$ 1.4, chronic obstructive pulmonary disease on chest x ray as hyper resonant with pulmonary congestion).
- History of previous cardiac surgery.

Data Collection: Quantitative and qualitative variables were filled to the predesigned performa. 140 participants (70 in each group) who fulfilled the criteria for participation were included in the study. A detailed social and demographic profile (age, gender, height, weight, BMI). Clinical history, i.e. (Diabetes Mellitus, Smoking, Hypertension) and clinical trials were assessed, i.e. preoperative EF (percent) was calculated.

Statistical Analysis: Using SPSS Version 24.0.0, statistical analysis was carried out. Qualitative variables such as gender, risk factors such as DM, HTN, smoking, and superficial sternal infection were represented as percentages, whereas quantitative variables such as age, height and weight were described as mean \pm standard deviation. Chi-square test was used to determine the

association of obesity with infection of sternal wound. P value ≤ 0.05 was considered as significant.

RESULTS

The mean age of cases in obese and non-obese group was 47.80 ± 9.79 years and 51.23 ± 9.36 years respectively. The mean height, weight and BMI in obese and non-obese groups was 1.65 ± 7.20 m and 1.69 ± 9.13m, 84.01±8.39 and 58.50±9.22kg, 30.78±3.68 and 20.43 ±2.85 respectively.

In our study there were 48 (69%) hypertensive patients in obese group while 40 (57%) hypertensive patients in non-obese group. There were 47 (67%) diabetic in obese group while 45 (64%) diabetics in non-obese group. There were 29 (41%) smokers in obese group while 42 (60%) smokers in non-obese group. (Table-1)

Table 2 showed that the mean ejection fraction was 50.57 ± 9.61 in obese group and 48.14 ± 10.74 in non-obese group, p-value = 0.26. Which was not statistically significant showing no difference in EF of both groups. (Table-2)

Table 1: Descriptive Statistics of Demographics:

Variables	Obese	Non-Obese
Age	47.80 ± 9.79	51.23 ± 9.36
Height	1.65 ± 7.20	1.69 ± 9.13
Weight	84.01 ± 8.39	58.50 ± 9.22
BMI	30.78 ± 3.68	20.43 ± 2.85
Hypertension	48 (69%)	40 (57%)
Diabetes	47 (67%)	45 (64%)
Smokers	29 (41%)	42 (60%)

Table 2: Comparison of EF in both Groups.

Ejection Fraction	Obese (n=70)	Non-Obese (n=70)	Total (n=140)	Mean	S.D	Minimum	Maximum	P-value
				50.57	9.61	30.00	70.00	
	48.14	10.74	25.00	70.00				
	49.36	10.23	25.00	70.00				

Table 3: Stratification of Post-Operative Infection in terms of Age, Gender, DM, HTN and Smoking Status in both Groups.

Age (Years)	30- 40	Groups	Post-Operative Infection		P-Value
			Obese	No	
		Obese	17	2	0.01
		Non-Obese	2	9	
	41-50	Obese	19	6	0.001
		Non-Obese	5	17	
	51-60	Obese	16	3	0.001
		Non-Obese	4	23	
61-70	Obese	7	0	0.042	
	Non-Obese	4	6		
Gender	Male	Obese	39	5	0.001
		Non-Obese	13	38	
	Female	Obese	20	6	0.001
		Non-Obese	2	17	
DM	Diabetic	Obese	38	9	0.001
		Non-Obese	4	41	
	Non-Diabetic	Obese	21	2	0.001
		Non-Obese	11	14	
HTN	Hypertensive	Obese	37	11	0.001
		Non-Obese	4	36	
	Non-hypertensive	Obese	22	0	0.001
		Non-Obese	11	19	
Smoking Status	Smokers	Obese	25	4	0.001
		Non-Obese	8	34	
	Non-Smokers	Obese	34	7	0.001
		Non-Obese	7	21	

Table 3 showed that in all the above mentioned risk factors obesity was associated with post-operative infection

Table 4: Comparison of post-operative infection in both groups.

Study Groups	Post-operative infection		P-value
	Yes	No	
Obese	59(84.29%)	11(15.71%)	0.001
Non-Obese	15(21.43%)	55(78.57%)	
Total	74(52.86%)	66(47.14%)	

Table 4 showed that there was a significant difference in wound infection in obese versus non-obese groups.

DISCUSSION

Obesity is frequently regarded a risk factor for peri-operative morbidity and mortality in heart surgery and other major surgical procedures⁸. Predisposing factors related to the prevalence of cardiovascular disease, such as hypertension, hypercholesterolemia, and diabetes, as well as technical problems in surgical and postoperative treatment of obesity, are expected to result from these viewpoints⁹. Obesity has also been linked to a higher risk of serious complications following major procedures. The effects of previous research on the association between obesity and the likelihood of adverse CABG results are contradictory because there is insufficient potential to test relatively uncommon events or evidence to account for confounding factors.

The mean age of cases in obese and non-obese group was 47.80 ± 9.79 years and 51.23 ± 9.36 years respectively. The mean height, weight and BMI in obese and non-obese groups was 1.65 ± 7.20 m and 1.69 ± 9.13m, 84.01±8.39 and 58.50±9.22kg, 30.78±3.68 and 20.43 ±2.85 respectively. In our study there were 48 (69%) hypertensive patients in obese group while 40 (57%) hypertensive patients in non-obese group. There were 47 (67%) diabetic in obese group while 45 (64%) diabetics in non-obese group. There were 29 (41%) smokers in obese group while 42 (60%) smokers in non-obese group.

In another study 182 patients (145 males (79.6%), with age range 45.0–87.0 years underwent elective CABG. A history of diabetes mellitus, arterial hypertension and hypercholesterolemia were evidenced in 64 (35.1%), 133 (73.0%) and 121 (66.4%) cases, respectively. Among the 64 patients with diabetes mellitus, 19 (29.6%) were being treated with insulin before surgery. Forty-one patients (22.5%) were smokers. Median BMI was 27.7 [18.7–50.5] kg/m² and there were 51 (28.0%) and 79 (43.4%) patients with obesity and overweight, respectively¹⁰.

The mean ejection fraction was 50.57 ± 9.61 in obese group and 48.14 ± 10.74 in non-obese group, p-value = 0.26. Which was not statistically significant showing no difference in EF of both groups. Similarly in a previous study the mean EF was 49.1 ± 10.2 in obese group while 50.7 ± 11.2 was in non-obese group with statistically insignificant p-value 0.26¹¹. Supported our results

In our study obesity was associated with post-operative wound infection there was a significant difference in wound infection in obese versus non-obese groups. The results of a previous study found that the independent predictor of sternal wound infection was BMI ≥30 kg/m² P<0.001¹². Another study also found obesity or BMI strong predictor of sternal wound infection in obese versus non-obese groups with highly significant p-value <0.001¹³.

CONCLUSION

Sternal wound infection was a significant outcome in our research. We found strong association of obesity with post-operative sternal wound infection as the post-operative infection was more in obese patients as compared to non-obese. In all the major groups according to age, gender, diabetes, smoking and hypertension the obese were seen to have increased risk of SSI, so, obesity was an independent major risk factor causing SSI which supports our results.

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