

Intraoperative and Postoperative Blood Transfusions in Patients with Low Body Mass Index Undergoing Coronary Artery Bypass Grafting

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Abstract

Objective: The purpose of this research was to determine the frequency of Intra and postoperative blood transfusion in patients with low Body mass index (BMI) undergoing Coronary artery bypass grafting (CABG).

Methodology: This is a six months case series from December 2017 to June 2018 performed at Tabba Heart Institute, Karachi. One hundred and seventy-two (172) patients were recruited after informed consent on the basis of inclusion/exclusion criteria. The outcome variable i.e. intraoperative and postoperative blood transfusions requirements were noted.

Results: The age range of the patients in this study was 25 to 60 years with mean age 63.1 ± 17.47 years, with mean height 161.94 ± 7.26 cm, mean weight 57.51 ± 11.8 kg and mean body mass index (BMI) was 21.5 ± 1.9 kg/m². Out of 172 patients, 109 (63.4%) were males and 63 (36.2%) were females. 46.5% (n = 80) of the patients with low BMI underwent CABG required intraoperative blood transfusion while 37.9% (n = 65) required the postoperative blood transfusion.

Conclusion: BMI is one of the considerable predictors of blood transfusion in patients during and after coronary artery bypass grafting. Our study suggests that lower levels of BMI anticipate more blood loss after procedure thus requiring an increased number of intra and post-operative blood transfusions after CABG. Therefore, it can conclude the significance of a patient's BMI in predicting the perioperative sequelae of CABG surgery.

Keywords: Intra-Operative; Post-Operative; blood Transfusions; CABG Surgery

Introduction

Cardiovascular surgery carries a higher risk of sternal, lung and other major organs related complications in obese patients [1]. But an increased rate of mortality after coronary artery bypass grafting (CABG) has been reported for the underweight population as well [2]. Therefore the effect of weight cannot be managed with wide-sweeping generalizations; rather specific measurable variables must be evaluated and considered preoperatively [3]. One such modifier is intraoperative bleeding and mostly managed with volume and blood transfusion, it inherently results in more morbidity via transfusion reactions, sepsis, Transfusion-related lung injury (TRALI), Transfusion-associated circulatory over-

load (TACO) and increased mortality. It is observed that less body weight and body surface area are independent predictors of transfusion requirement [4].

One study has shown patients with BMI of less than 25, 41.1% were transfused blood during operation while 32.3% received blood after surgery within 72 hours of CABG [5].

Purpose of the Study

The purpose of my study is to determine the frequency of Intra and postoperative blood transfusion in patients with low BMI undergoing CABG. The studies have shown decreased intraoperative

transfusion requirement with lower postoperative blood loss in obese patients [5]. In contrast to that our study provided the results in a range of low BMI patients and thereby strategies could be made accordingly. Hence, the target of this research is to determine the frequency of Postoperative and Intraoperative blood transfusion in patients with low BMI undergoing CABG.

Methods

This study was conducted from December 2017 to June 2018 at the department of cardiac surgery, Tabba Heart Institute (THI), Karachi. The data collection was started after ethical committee approval. Patients of either gender, age ranging from 25 to 60 years, undergone isolated CABG with baseline haemoglobin (Hb) of more than 10 g/dl, and BMI of less than 25 kg/m² were included in the study. In these patients, intraoperative blood transfusion and postoperative blood were assessed. Patients undergoing valve surgery, emergent surgery, aneurysms procedure or patent foramen ovale repair were excluded from the study. Data were analysed with the help of Statistical Package for the Social Sciences (SPSS) software, version 20.

Results

A total number of 172 patients were enrolled in the study with mean age 63.1 ± 17.47 years and mean BMI was 21.5 ± 1.9 kg/m². Out of 172 patients, 109 (63.4%) were males while 63 (36.2%) were females.

Characteristics	Summary Statistics
Total patients (N)	172
Gender	
Male	63.4% (109)
Female	36.6% (63)
Age (years)	63.1 ± 17.47
25 - 40 years	40.7% (70)
40 - 60 years	59.3% (102)
Height (cm)	161.94 ± 7.26
Body weight (kg)	57.51 ± 11.8
BMI (kg/m ²)	21.5 ± 1.9
Educational status	
Uneducated	2.9% (5)
Primary	5.8% (10)
Secondary	17.4% (30)

Intermediate	22.7% (39)
Graduate	12.2% (21)
Higher Education	39% (67)
Monthly household income	
≤ Rs. 20000	13.4% (23)
Rs. 21000 to 50000	39.5% (68)
> Rs. 50000	47.1% (81)

Table 1: Baseline patients’ demographics.

A total of 80 (46.5%) patients required intraoperative blood transfusions and 65 (37.9%) required postoperative blood transfusions. When intraoperative blood transfusions were stratified with respect to gender and age, a marked difference was noted and when post-operative blood transfusions were stratified with respect to gender and age of the patient, showed no significant difference.

Discussion

After analysis of the variables, we demonstrate that BMI is an important indicator of blood transfusions requirement. Several studies done in the past also support our findings with approximately similar results in low BMI groups of patients [4,10-12].

Interestingly, Alam., *et al.* observed in their study that the risk of reopening for bleeding or postoperative bleeding was less in obese patients. However, the study was lacking in giving the evidence of how postoperative bleeding was measured [10]. The study mimicking our result conducted by Reeve., *et al.* [9] they analyse not only intraoperative and postoperative blood transfusions but also included the blood loss observed in chest tube output, they concluded that patients with moderate to high BMI are preserved from reoperation and high chest drain output (> 1000 ml) and also required less number of intraoperative and postoperative blood transfusions. The odd ratio was linear in that output category; however the blood loss < 1000 ml was not reviewed. In consonant these findings with the result of our study, we observed that 80 (46.5%) of the patients with low BMI underwent CABG required intraoperative blood transfusions and 65 (37.9%) required the postoperative blood transfusions. Further, when results were stratified with respect to age and gender, significant difference was observed. Similarly, when intraoperative blood transfusions were stratified

Demographics	Total Patients	Blood transfusions rate	
		Intra-operative	Post-operative
Total patients (N)	172	46.5% (80)	37.8% (65)
Gender			
Male	109	53.2% (58)	38.5% (42)
Female	63	34.9% (22)	36.5% (23)
P-value	-	0.021	0.792
Age			
25 - 40 years	70	32.9% (23)	40% (28)
40 - 60 years	102	55.9% (57)	36.3% (37)
P-value	-	0.003	0.621
Educational status			
Uneducated	5	40% (2)	20% (1)
Primary	10	30% (3)	60% (6)
Secondary	30	46.7% (14)	36.7% (11)
Intermediate	39	56.4% (22)	30.8% (12)
Graduate	21	52.4% (11)	42.9% (9)
Higher Education	67	41.8% (28)	38.8% (26)
P-value	-	0.607	0.569
Monthly household income			
≤ Rs. 20000	23	43.5% (10)	34.8% (8)
Rs. 21000 to 50000	68	42.6% (29)	29.4% (20)
> Rs. 50000	81	50.6% (41)	45.7% (37)
P-value	-	0.594	0.119

Table 2: Intra-operative and post-operative blood transfusions in patients with low BMI undergoing low CABG.

with educational status and socioeconomic status, no significant difference was observed. When post-operative blood transfusions were stratified with respect to age, gender, educational status and income, no significant difference was observed.

The study we conducted is different in a way that we assess the requirement of blood transfusion based on their association with the specific surgical procedure and we clarify obesity based on different categories of BMI. Furthermore, our study is one of the few that makes use of chest tube drainage from surgical sites as an estimate of postoperative bleeding and found that the variables evaluated before surgery determine these parameters are not similar as those which needed blood transfusion during surgery. BMI is easy to calculate, cost effective and one of the prominent

predictive markers in our preoperative assessment and further analysis will clarify how to incorporate BMI into a predictive model that will help us to pre-visualize the coagulation of that specific patient before surgery, along with that more data is required to interpret the etiology behind the effect of BMI on patient coagulation and need further research on molecular level to make that assumption and regardless what this concludes it proves that it is critical at the clinical level to consider patient’s BMI gravely when assembling for perioperative sequelae of coronary artery bypass grafting.

Lately few randomized controlled trials have been done on blood transfusions in terminally ill or CABG patients [6]. Further short term deleterious effects of transfusion have been documented but few papers have studied long term survival as well [7,8]. Re-

ardless of all available data, decisions for blood transfusion vary significantly [9,11]. Like taking a decision which patient should get transfusion varies substantially among surgeons, intensivists and anaesthetists [9,12,13] and the rate of transfusion of packed cells and other blood products in cardiac surgical patients is always high [14].

In this study, we observed among the ethnic Pakistani population that more Blood transfusions were required in patients with low BMI after CABG. Lastly, analysis was limited to the single centric outcome data only with limited number of patients therefore additional multicentre studies with addition of more preoperative, perioperative and patient related factors determining transfusion requirement will illustrate better conclusion.

Conclusion

BMI is a crucial independent predictor of the requirement of intraoperative and post-surgical blood transfusion in patients after CABG. Our study suggests that lower levels of BMI anticipates more blood loss thus requiring increased intraoperative and postoperative blood transfusions in CABG surgery patients. Thus, it can be concluded that checking a patient's BMI should be kept in mind when preparing a patient for perioperative sequelae after surgery.

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