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Original Article

Preoperative Anemia as a Predictor of Morbidity and Mortality in Coronary Artery Bypass Grafting Surgical Patients: Our Four Years' Experience

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ABSTRACT

Preoperative anemia is associated with increased morbidity and mortality after cardiac surgery, so we looked into the effect of preoperative hemoglobin levels on early outcome of coronary artery bypass grafting (CABG). **Objective:** To assess the role of preoperative anemia as a predictor of morbidity and mortality among patients who went through coronary artery bypass surgery. **Methods:** A retrospective study was carried out among patients who suffered from isolated CABG surgery. These patients were considered anemic with hematocrit levels less than 35.0 in females and less than 40.0 in males. The results were evaluated by using SPSS 24.0. **Results**: Overall mortality rate among patients who went through CABG was 3.9%. The mean hematocrit level among these patients was less than 30. **Conclusions:** It is concluded that the patients presented with preoperative anemia who have to undergo coronary artery bypass surgery are more likely to encounter co-morbidities and death after the surgery.

INTRODUCTION

Anemia is a clinically critical trait and is common among patients presenting for surgery [1]. Iron deficiency (ID) is frequent in heart failure, with a prevalence of about 50% regardless of sex, race, anemia, and left ventricular function [2]. Incidence of iron deficiency anemia (IDA) is prevalent among patients suffering from heart failure with a prevalence rate of 50% irrespective of race, gender, and age [3]. Keeping in view the conditions mentioned, anemia is linked with the worst postoperative outcomes. There is vague information regarding the effect of particularly IDA or other types of preoperative anemias on cardiac surgery. Nearly 20% of patients who have to undergo coronary artery bypass surgery suffer from preoperative IDA. 20-30% of patients subjective to CAB surgery presented low stores of iron. In all such patients, preoperative anemia is subjected to treatment before proceeding with the surgery [4-6]. Lower rates of transfusion, decreased hospital stay and low postoperative fatigue are some benefits of preoperative anemia treatment. Therefore, it is recommended to treat anemia before coronary artery bypass surgery [7]. Formerly, a noteworthy connection between anemia and significantly elevated morbidity and mortality has been developed in numerous studies related to cardiac and non-cardiac surgeries collectively [8,9,10]. Patients presenting for CABG have limited coronary reserves and because of this, they are more vulnerable to the effect of decreased red blood cells [11-13]. However, the data available do not starkly explain the precise connection between the severity of anemia before surgery and its aftermath on CABG patients and do not measure the effect of already existing medical conditions on this connection.[14,15] Moreover, it is not known whether the consequences of anemia on the end result are due to low hemoglobin levels in themselves or due to interrelation

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with other risk factors commonly ubiquitous in anemic patients [16]. At last, there is very limited information at hand about the incidence, degree, and paramount causes of anemia, particularly in patients presenting for cardiac surgery [17]. This study was carried out to contribute towards the research pool available to check the effects of preoperative anemia on the postoperative morbidity and mortality.

METHODS

A retrospective observational study among patients who underwent coronary artery bypass surgery was carried out at Rehman Medical Institute from 2017 to 2021. A random probability sampling technique was used for the selection of sample patients. Exclusion criteria for the sample patients were unknown hemoglobin levels, patients who were critically ill, patients suffering from medical emergencies, and emergency operations. Data were analyzed by using SPSS 24.0.

RESULTS

Results showed that among a total sample of 2231 patients with CABG, 1723 were male while 508 were females. The overall mortality rate among CABG patients was 3.9%. As the preoperative anemia was measured on the basis of hematocrit levels, hence mean hematocrit level among patients was 30.17. Postoperative complications were presented by 22% patients (Table 1).

Variables	Frequency	Percentage
Isolated CABG	2231	100%
Male	1723	77.2%
Female	508	22.8%
Hematocrit (Mean)	2211 (30.14)	76.50 (SD)
Intra OP blood product	1547	69.3%
Post OP blood product	1171	52.5%
Post OP Complications	491	22%
Reopen	159	7.1%
Mortality	88	3.9%

Table 1: The overall CABG from 17 July 2017 to August 2021 and its morbidity and mortality

Of the total sample, 1723 were males and 508 were females. The mean age of the patients was 58.28 and 56.81 respectively. Other parameters included weight and height. Among males 4.6% and among females 3.9% had a family history of coronary artery disease. 41.7 % of males and 62.2% of females were suffering from preoperative diabetes. 61.1% of males and 81.5% of females had hypertension. The calculated standard deviation of preoperative WBC count in males was 14.83 and in females was 3.15 (Table 2).

Variables	Male (n=%)	Female (n=%)
Gender	1723	508
Age (Mean)	58.28 (9.275SD)	56.81 (8.48SD)
Weight (Mean)	76.60 (20.73SD)	69.52 (13.69SD)
Height (Mean)	167.25 (37.47SD)	156.29 (11.77SD)
Family history of CAD	79 (4.6%)	20 (3.9%)
Diabetes	718 (41.7%)	316 (62.2%)
Hypertension	1053 (61.1%)	414 (81.5%)
Dyslipidemia with statins	886 (48.6%)	271 (53.3%)
Last WBC	9.11 (14.83SD)	9.44 (3.15SD)
Myocardial infraction	507 (29.4%)	130 (25.6%)
Left main stem	229 (13.3%)	63 (12.4%)
Ejection Fraction	49.48 (10.42SD)	50.54 (10.47SD)
Perfusion Time	98.86 (26.34SD)	98.30 (28.74SD)
Cross clamp time	54.95 (18.14SD)	54 (18.70SD)

Table 2: Pre OP patients' characteristics

DISCUSSION

The current study illustrated that preoperative anemia is a marker of morbidity and mortality in patients undergoing coronary artery bypass surgery. Anemia is a deep-rooted risk element for CVD [18]. The author of ARIC (Atherosclerotic risk in communities) studied 14410 samples within a population among the age group of 45-65 years with a conclusion that anemia was associated with elevated incidence of multiple chronic cardiac disorders. Furthermore, numerous studies have set out that in heart failure and coronary artery disease, low hemoglobin levels were independent predictors of mortality and morbidity [19]. Moreover, Sabatine et al., reviewed 39,992 patients and maintained that people suffering from ST ELEVATION MI had an escalating increase in deaths due to CVD as the initial levels of oxygen-carrying proteins decreased by less than 14g/dl, on the other hand, samples with non-ST elevation MI had an increased chance of cardiovascular-related death, myocardial infarction, and recurrent ischemia as the baseline hemoglobin dropped lower than 11g/dL [20]. The most widespread hematological hazard in the preoperative patients is anemia and according to definitions, it occurs from 22% to 30% and up to 80% in the age group between 80 to 89 years. WU et al inspected the effect of hematocrit levels before operation in elderly people subjects to surgeries other than heart surgery and established that there can be an increase of 30 days in hospital stay, adverse situations, and death. Furthermore, cardiac events and death were directly proportional in the presence of below 39% hematocrit level [21]. According to another study carried out by Karkuti et al, the same relationship between preoperative anemia increased hospital stay, comorbid conditions, and death was established as formerly described [19]. A study performed by Zindrou et al showed that hemoglobin levels up to 10g/dl or less increased the probability of in-hospital death after CABG thrice as compared to people with normal hemoglobin [22].

CONCLUSIONS

It is concluded that low levels of hemoglobin presented as anemia or iron deficiency anemia preoperatively play a major role in an increased incidence of severe after-effects of coronary artery bypass surgery and death. Therefore,

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anemia can be used as a predictor or indicator of after surgery situation.

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