Original Article

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IMPACT OF PRE-OPERATIVE ANEMIA ON POST-OPERATIVE OUTCOME ON PATIENTS UNDER GOING CARDIAC SURGERY

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ABSTRACT

Objective: To assess the effect of patient blood management preoperatively on long term chances of survival and postoperative morbidity after cardiac surgery.

Study Design: Prospective observational study.

Place and Duration of Study: Study was conducted at Armed Forces Institute of Cardiology from June to October 2014.

Material and Methods: The study was undertaken on 620 consecutive patients undergoing cardiac surgery. Of six hundred and twenty patients in study population, 196 (31.6%) patients with pre-operative anemia were compared with 424 (68.3%) non anemic patients. Data was analyzed on SPSS version 17. Ethical approval was obtained from Institutional Ethical & Review Board of AFIC.

Results: Overall prevalence of preoperative anemia in study population was found to be 38%. Prevalence of anemia was higher in females as compare to males (52% vs 25% $p = 0.001$). Duration of stay in ITC (2.5 ± 2 vs 3 ± 3.5 $p = 0.003$), death in OT (2.4% vs 8.85% $p = 0.002$), and number of blood transfusions (17% vs 48% $p = 0.004$) were higher in anemic patients as compared to non anemic patients.

Conclusion: In Patient undergoing cardiac surgery Pre-operative anemia was associated with high risk of deaths, with increase ITC stay and higher number of blood transfusion.

Keywords: Preoperative anemia, Post -operative morbidity, Post-operative mortality.

INTRODUCTION

Anemia is the commonest hematological problem in the pre-operative patients in third world countries[1]. Data from many retrospective studies suggest that preoperative anemia has independent harmful effects in post-operative patients[2]. Data suggest that Preoperative anemia in cardiac surgery patients, In particular, is associated with poorer postoperative outcome, most probably because the degree of acute anemia that patient can safely tolerate during cardiac surgery is inversely related to their baseline Hb (Hemoglobin) concentration[3]. Moreover cardiac surgeries are often associated with considerable blood loss which is insult to injury in case of anemic patients. Anemia therefore has been reported to be an independent risk factor for both short and long term mortality and morbidity in patients with undergoing congestive heart failure[4], cardiac surgery[5] and in coronary artery disease [6,7]. Whereas higher preoperative hemoglobin levels have been found to be associated with good long term survival and decreased adverse postoperative outcome[7,8]. Low level of hematocrit and increased blood product transfusions are associated with increased duration of hospital stay, infection, low cardiac output and operative mortality in cardiac surgery patients[9-11].

Rationale of the study is to highlight the need for improved patient blood management preoperatively to improve their long term chances of survival and reduce postoperatively morbidity after cardiac surgery. We analyzed the prevalence and influence of pre operative anemia on patient's survival chances, transfusion rates and duration of stay in ITC, in patients undergoing cardiac surgery.

MATERIAL AND METHODS

The prospective observational study was conducted in adult ITC AFIC, Rawalpindi. Data

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of 620 consecutive patients undergoing cardiac surgery at AFIC from June to October 2014 was analysed. Data was collected on preformed pretested questionnaire. Study sample consisted of 620 patients. Of them 196 (31.6%) patients were anemic and 424 (68.3%) were not anemic. Senior staff members performed all procedures, standard anesthetic and surgical techniques and postoperative care were followed according to the standard protocols of the institute, in the care of each patient. Patients of all ages and genders undergoing cardiac surgery were enrolled, excluding those with history of recent blood loss, on anticoagulant therapy, history of bleeding, any medical conditions causing anemia.

Questionnaire consisted of three parts. 1st part contained socio demographic information like age, gender, geographical location, 2nd part contained clinical information like height, weight, BMI, pre-operative hemoglobin, history of bleeding, anticoagulant therapy, recent blood loss and any medical condition causing anemia. The 3rd and the last part had information like post operative haemoglobin, length of stay in ITC, if patient has survived and information on post operative blood transfusion. Data was recorded and analyzed according to the presence or absence of preoperative anemia (Hb < 13 g/dL for men, Hb < 12 g/dL for women)[12], on SPSS version 17.

Data analysis

After checking the normality of distribution, statistical analysis was carried out. Descriptive statistics (mean ± SD) were calculated for all continuous variables and percentage (%) was calculated for categorical variables. Patients were divided in two test groups; one with normal Hb levels and second with Hb levels less than normal. Preoperative variables were compared using chi square and T- test. Chi square test was used to compare prevalence of anemia between males and females and survival status. T test was applied for the comparison of mean hemoglobin levels and mean length of hospital stay, in preoperatively anemic patients versus patients who were not anemic.

Ethical consideration

The study was approved by Institutional Ethical & Review Board of Armed Forces Institute of Cardiology Rawalpindi. Informed written consent was taken by either patients or their first degree relatives.

RESULTS

A hospital based prospective observational was conducted on six hundred and twenty patients undergoing elective cardiac surgery.

Table : Demographic and clinical data of patients undergoing elective cardiac surgery, according to the presence or absence of preoperative anemia.

Variables		Non - anemic	Anemic	*p*- value
Preoperatively	No. of Patients (n=620)	423 (68.2%)	197 (31.7%)	-
	• Females • Males	61 (14.4%) 362 (85.5%)	67 (34%) 130 (65.9%)	0.001
Post operatively	No. of Patients (n=620)	142 (22.9%)	478 (77.1%)	0.001
	• Female • Male	29 (20.4%) 113 (79.5%)	99 (20.7%) 379 (79.2%)	0.001
Survival Status	• Death in OT • Shifted to the ward	10 413	16 181	0.002
Hospitalization	Duration of ITC stay (days)	2.5 ± 2	3 ± 3.5	0.003

Mean age was 52 ± 13 years whereas 128 (21%) patients were females and 429 (79%) patients were males. One hundred and ninety seven out of these 620 (38%) patients presented with preoperative anemia. Prevalence of anemia postoperatively was 64% and 397 patients with preoperative anemia showed lower Hb level in immediate postoperative period ($p < 0.001$). While prevalence of anemia was significantly higher in females as compare to male patients

both preoperatively and postoperatively as shown in table-1.

The length of ITC stay in days was higher in the anemic groups than in the non-anemic group (2.5□ ± □2 vs 3□ ± □3.5 days; *p* = 0.003). There were a significant difference between groups regarding in-hospital mortality (2.4% vs 8.8%; *p* = 0.002) in non anemic and anemic patients respectively. However, total number of transfusion units were significantly higher in the anemic group when compared with the control group (*p* = 0.004) (Fig-2), with a trend toward a higher transfusion volume per transfused patient in the anemic group.

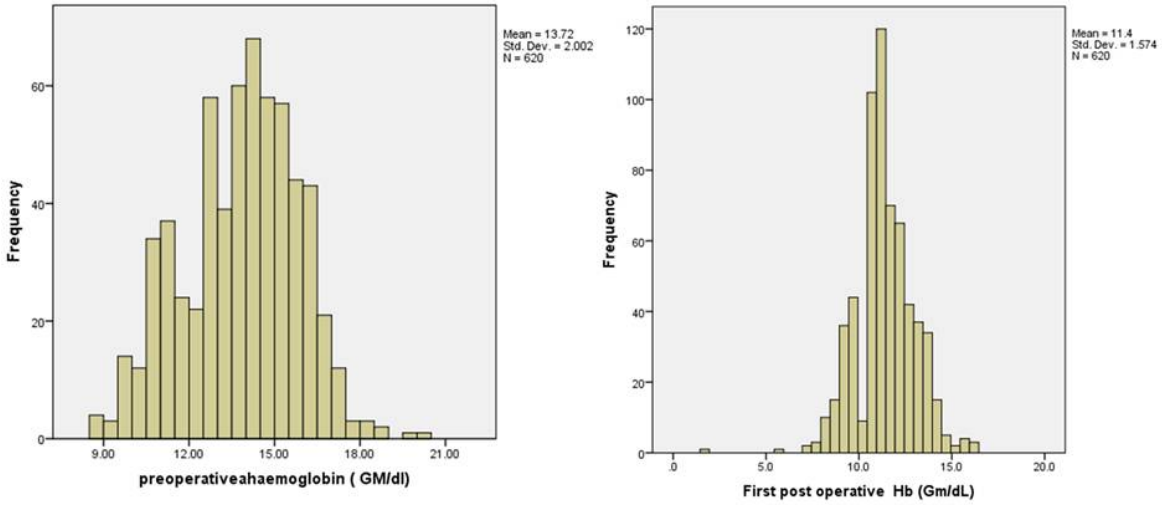

Figure-1: Pre and post operative distribution of hemoglobin in gm/dl in study population.

DISCUSSION

In this study prevalence of preoperative anemia was 38% among patients under going cardiac surgery. This prevalence is similar to other studies in which low preoperative haemoglobin was found to be associated with higher risk for postoperative morbidity and mortality[13,14]. Preoperative anemia is among few conditions that can be corrected prior to surgery, by applying simple prophylactic and therapeutic measures[15].

There was a significant difference between the anemic and non-anemic group in length of hospital stay in days in the study which is in agreement with the study by Antonio et al that reports similar results i.e there was a significant difference in hospital stay among the two groups (54% vs 36.7%, *p* □<□0.0001)[16]. Data from study by Baron et al reports that patients suffering from preoperative anemia were more frequently admitted to ICUs compared with those with normal preoperative Hb concentrations and preoperative anemia increases length of stay in surgical patients. Our study showed that patients with low preoperative Hb concentrations were discharged from the hospital later than those with normal preoperative Hb concentrations. Hospital length of stay was also found to be greater in patients suffering from severe and moderate preoperative anemia, and was further prolonged in patients with mild preoperative

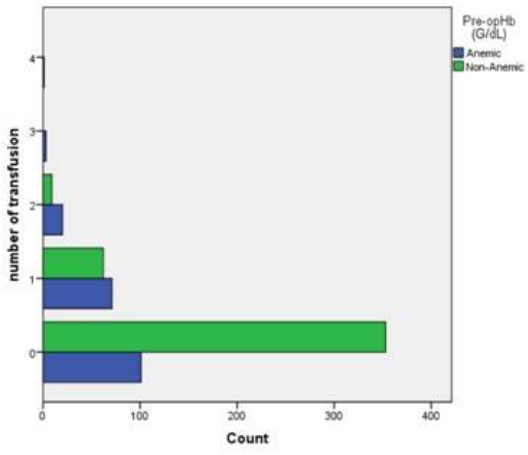

Figure-2: Comparison of anemic and non anemic patients by number of blood transfusion received in immediate postoperative period.

anemia when compared to those with normal preoperative Hb concentrations (p <0.001)[17]. Overall, 167 (27 %) patients received at least one unit blood transfusion postoperatively in the present study. The rate was higher in anemic group than in non anemic group (48% vs 20%; p = 0.004) as 9 non-anemic patients and 24 anemic patients received more than one blood unit in study population. This is in accordance with previous publications[13,18] where transfusion rate was higher in the anemic group than in the non-anemic group. Transfusion rate in present study was nearly similar to that reported by other studies[3,19] but lower than those reported in other Spanish study[20].

Overall mortality was higher in anemic patients than non-anemic patients in present study. In a Spanish study similar mortality rates (5.4%) were found in both anemic and non-anemic groups[21] and were not affected by the presence of preoperative anemia. However, a Canadian multicenter prospective study of 3500 patients undergoing cardiac surgery found that anemic patients showed a higher rate of postoperative mortality when compared with non-anemic patients (OR 2; 95% CI 1.4–2.8)[13].The logical reason may be that the degree of acute anemia that a patient can tolerate safely during cardiac surgery is inversely related to their baseline hemoglobin concentration[3]. Significant blood loss is common during surgery, and many patients have depressed bone marrow function after surgery [22,23]. Kulier et al[7] performed a study of 4804 cardiac surgery patients who had not received preoperative blood transfusion, to explore a possible association between the lowest preoperative Hb levels and the rates of postoperative morbidity and in-hospital mortality of cardiac and non-cardiac origin. They reported an increased risk of postoperative morbidity in anemic cardiac surgery patients, which started at Hb < 11 g/dL and was modulated by the effect of comorbidity on anemia tolerance. It is possible to imagine that patients with low preoperative haemoglobin can be benefited by perioperative of transfusion to treat acute anemia that is induced by blood loss during surgery. This may outweigh the risks of postoperative complications due to low haemoglobin concentration. Surgenor et al[24]., In contrast, has recently reported that long-term survival was decreased significantly for patients exposed to 1 or 2 U of RBCs during hospitalization for cardiac surgery compared to ones who received none (p < 0.001). As a post-discharge follow-up was not performed therefore it was not possible to exclude negative effect of anemia and/or transfusion on long-term mortality. But the need for blood transfusion with all its side-effects can also be regarded as a secondary effect of anemia.

Limitation of our study was that the sample was limited to adult patients who underwent surgery in a single center and only in hospital mortality was recorded; long term mortality was not recorded as it was beyond the scope of the study.

CONCLUSION

Preoperative anemia has a high prevalence among cardiac surgical patients and this increases postoperative morbidity. Therefore, we need to address two specific areas about preoperative anemia in these patients: early recognition and evaluation, and appropriate and timely treatment. This in turn will result to reduce our resource utilization in term of prolonged and intensive medical care required by these patients postoperatively. Correction of haemoglobin concentration also might reduce mortality and morbidity in these patients.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author

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