

# The Comparison of Pre and Post-Operative Hemoglobin Level in Elderly Undergoing Major Orthopedic Surgery

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**Background:** Anemia is a common disease in older patients and prevalence of anemia increases with high age. Preoperative anemia is associated with high mortality after surgery. The severity of anemia is variable and is affected by blood loss volume, pre-operative hemoglobin (Hb) value and transfusion during surgery. However, the strategies of blood management for optimization of Hb before surgery are more important. Therefore, surgery and anesthesia teams always follow these issues: how we can decrease intraoperative blood loss and complications of bleeding and transfusion? However, the aim of study was comparison of Hb in pre- and post- operative period in older patients undergoing major orthopedic operation.

**Methods:** A descriptive cross-sectional study was conducted on 230 patients aged more than 65 years who underwent orthopedic surgery from 2016 through 2017. Hb value was measured after and before surgery and compared.

**Results:** The mean age of participants was 75.8. 54.3% of cases were female. Most of the patients (70.4%) had concurrent disease such as hypertension, diabetes mellitus and heart disease. The most common types of surgery were as follows: DHS, total replacement of knee and hip bipolar hemiarthroplasty. The mean difference value of Hb in pre and post- operative period was significant and was reduced from 12.6 to 10.3g/dL.

**Conclusion:** The mean difference value of Hb in pre and post- operative period was significant. However, orthopedic surgeries can reduce Hb in older patients. In regard to older subjects being considered as high-risk group, routine control and proper correction of Hb in such operations is necessary.

**Keywords:** Older subjects; Anemia; Orthopedic surgery; Hemoglobin

Anemia is a common disease in elderly [1]. Anemia was defined based on world health organization statement ( $Hb \leq 12$  gr / dL in women and  $Hb \leq 13$  in men). The prevalence of anemia increases with age, it seems 26.1% of men and 20.1% of women are involved [2]. Preoperative anemia is associated with high surgery related mortality [3]. The severity of anemia is variable and affected by bleeding volume, preoperative Hb value and intraoperative transfusion [4]. Conventionally, clinicians believed that reduction of Hb value may be normal result of aging, but evidences showed anemia is a reflection of poor health condition, muscle weakness and increased susceptibility to adverse events in elderly [5]. In elderly subjects, anemia is a common problem and had serious outcomes; it is a result of aging dependent coagulopathies or secondary to different related disorders or concurrent diseases such as cancer, chronic kidney disease and congestive heart failure (CHF) or due to malnutrition and lack of iron [6]. The low level of Hb is an important

indicator of physiologic decline [7]. Accordingly, anemia and perioperative acute Hb fluctuations can induce long term adverse events such as infection, hospital stay and mortality and morbidity [8]. These complications occur remarkable in elderly and increase need to proper clinical care. However, the aim of study was evaluation of pre – and post – operative Hb level in elderly undergoing major orthopedic procedures.

## Methods

In this cross-sectional descriptive study, patients aged over 65 years old with ASA I & II were enrolled from 2016 through 2017. Data were collected by questionnaire and laboratory tests. The patients with bleeding disease and patients who received anticoagulants, were excluded from study. The documents of patients were surveyed and history of them was given. Preoperative Hb value was recorded and then anesthesia was induced. Anesthesia was induced based on patient condition or her/ his desires. General anesthesia was induced by same drugs (e.g. midazolam, fentanyl, propofol and muscle relaxant for tracheal intubation) based on routine manner. Regional anesthesia was performed as spinal anesthesia. During operation, blood loss volume was calculated and if necessary, transfusion was performed. Demographic data including age, gender, Hb value, concurrent disease, type of surgery, type of anesthesia, duration of surgery, blood loss volume and postoperative Hb were recorded. Data were analyzed by descriptive statistical

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methods (qualitative variables: frequency, percentage and quantitative variables: mean and standard deviation) in SPSS 16. P- value< 0.05 was considered significant.

## Results

The mean age of patients was 75.8 and most of them were female (54.3%) (Table 1). Almost all participants had concurrent diseases (70.4%). The most common diseases were hypertension, diabetes and heart disease. 63% of cases consumed various drugs (e.g. losartan, atenolol and aspirin plus metformin) (Table 1). The most common procedures were DHS, total knee arthroplasty and hip bipolar hemiarthroplasty, respectively. Spinal anesthesia was performed in 53.5% of cases. The mean of surgery time was 2 hours and 90 minutes. The bleeding volume was about 400 mL. 29.1 % of cases needed transfusion and approximately 1.8 units of blood were transfused (Table 1). The mean value of Hb was 12.6 gr/dL. After operation, the mean value reduced to 10.3. There was not any significant difference with mean pre Hb based on age group (p - value = 0.11) and there was significant difference with mean post Hb (p - value = 0.003). Also, comparison of 65 to 75 with 75 to 85 aged group and subjects older than 85 years old revealed significant difference of post-operative Hb value (p- value = 0.002). The mean perioperative blood loss volume based on concurrent disease did not show any significant difference. The high volume of blood loss was observed in total hip arthroplasty, DHS, hip bipolar hemiarthroplasty and total knee arthroplasty procedures, respectively (Table 1).

**Table 1- Preoperative patient characteristics and baseline functional capacity measures**

Variables	N=230 cases
Age (years)	75±7
Hb at baseline (g/dL)	
Females	12.3±1.3
Males	12/8±1.8
Sex	
Females	105±45.7
Males	125±54.3
drug use	
Yes	145(%63)
No	85(%37)
Comorbidity	
Hypertension%	81(%35.2)
Hypertension+ Diabetes%	30(%13)
Hypertension+Heart disease %	16(%7)
Diabetes %	11(%4.8)
Diabetes + Hypertension+ Heart disease %	5(%2.2)
	11(%4.8)
COPD, %	8(%3.5)
Kidney disease, %	4(%1.7)
Alzheimer%	

## Preoperative data

Anesthesia type	
General	107(%46.5)
Spinal	123(%53.5)
Duration of surgery (Hour)	2.9±1.1
Intraoperative blood loss (mL)	400±2.8
Liquid transfusions(L)	1.9±0.5
Blood transfusions(L)	1.8±0.9
Blood transfusions	
Yes	67(%29.1)
No	163(%70.9)

Data are presented as mean (SD) or median (interquartile range) for continuous variables and number (%) for categorical variables

## Discussion

Attention to the elderly in our culture and religion has a special place where, if it is provided, the society takes a more humorous condition [9]. Most of the participants in present study by average range of 75.8 years old had underlying illness (70.4%). The most common diseases were hypertension, diabetes mellitus and heart disease. In the present study, hypertension was the most commonly reported disease in the elderly, which was seen in 35.2% of cases alone and about one quarter of cases with other illnesses. In this regard, Peter Lloyd-Sherlock et al have shown that the prevalence of hypertension increases with age and is a risk factor for the most common causes of mortality at older ages [10]. However, other studies have shown that hypertension is one of the most important risk factors for cardiovascular disease and the most common cause of stroke, renal failure and anemia exacerbation in adults, especially in the elderly [11]. In this study, we observed heart diseases in more than 10 % of the elderly alone or in combination with other illnesses. Therefore, due to its effects, people who are undergoing major orthopedic surgeries and are prone to bleeding and exacerbation of anemia require attention and special measures. Carson et al showed that surgery on patients with cardiovascular disease and patients with chronic renal failure correlates with highest incidence of bleeding during the operation, volume of bleeding and mortality [12]. So, these groups should be receiving special attention. In this study, 63 % of cases were taking medication. Studies have shown that drug therapy in healthcare is a major challenge in the medical world, pharmacists, relevant authorities, and most importantly all patients. Based on the pharmacology management guidelines, clinicians should make necessary studies to reduce dose of drug and discontinue improper medication for each patient, especially in patients over 75 years, because inappropriate drugs are associated with higher risk of adverse side effects [13]. The most common type of DHS surgery is the knee total arthroplasty and bilateral hemiarthroplasty, respectively. The average rate of bleeding in our study was 400 mL. Kadono et al showed that amount of bleeding during orthopedic surgery, especially in the elderly, is relatively high. Therefore, orthopedic surgery can reduce hemoglobin levels in the elderly. Accordingly, the elderly was considered as high-risk group. The routine

control and timely correction of Hb are necessary options during orthopedic surgery [12]. In the present study, the mean Hb level before procedure was 12.6 gr/dL. After surgery, the rate of Hb value in most cases reduced to 10% of baseline. Therefore, the difference of pre- and post-operative mean Hb level was statistically significant. There was no significant difference in the mean of Hb level before surgery in three age groups ( $p= 0.11$ ). However, this difference was significant during postoperative period ( $p = 0.003$ ). Therefore, our results are indicative of significant decrease of Hb levels in subjects undergoing orthopedic surgery. In the Artz, Andrew S study, age was associated with a higher prevalence of anemia, so as frequency of anemia in subjects over 75 years old and 65 to 74 aged was 42.9% and 25%, respectively [14]. Su H et al reported reduced Hb levels in patients who underwent major orthopedic surgeries in 2014 [15]. Konrad I Gruson et al. reported that there was a significant difference between Hb levels during admission with postoperative Hb level in hip fracture [12], which was consistent with our findings. The present study showed that the difference of mean pre- and postoperative Hb level was statistically significant and reduced from 12.6 to 10.3 gr/ dL. Therefore, orthopedic surgeries can reduce Hb levels in the elderly.

## Conclusion

Authors concluded that the elderly are a high-risk group, routine control and timely correction of hemoglobin in orthopedic surgeries is considered necessary.

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