https://doi.org/10.46344/JBINO.2024.v13i03.15

OVERVIEW OF ANEMIA AFTER SCOLIOSIS SURGERY IN THE INTENSIVE CARE UNIT (ICU) SOEHARSO ORTHOPEDIC HOSPITALINDONESIA

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ABSTRACT

Anemia is a condition where the hemoglobin concentration is lower than normal. This condition reflects the lack of the normal number of erythrocytes in the body's circulation and consequently the amount of oxygen delivered to the body's tissues is also reduced. Miller & Thompson (2019) scoliosis comes from the Greek word "scoliosis" which means crooked. Scoliosis is a complex three-dimensional deformity of the spine characterized by a lateral deviation of at least 10 degrees with spinal rotation and is usually associated with a reduction in the normal kyphotic curvature of the spine / hypokyphosis. The cause of bleeding in spinal surgery usually occurs more in cases of rigid scoliosis, pedicle subtraction osteotomy and vertebral column resection often referred to as triple column osteotomy and is considered a procedure with a high risk of complications with massive blood loss, reaching more than 10 liters (Jun. 2019). Based on its classification, this type of research is retrospective descriptive research. studies that discuss one or more variables separately, one-by-one, but do not examine the relationship between these variables, using the observation method with the subject being observed by looking at past conditions (Harlan &Sutjiati, 2022). Using total sampling technique in sampling, the population is the medical records of patients admitted to the ICU, postoperative diagnosis of scoliosis with anemia, the sample size is 58 patient medical records. The variables observed were: indications for ICU admission and postoperative scoliosis, the inclusion criteria were medical record data for postoperative scoliosis patients with anemia admitted to the ICU for the period January 1 - December 31, 2022 and patients with the first scoliosis surgery. Based on this study, the following results were obtained: Most respondents were female (81%), the average age of respondents was 17 years. The most common type of scoliosis is adolescence idiopathic scoliosis (89.7%). The most Lenke classification is Lenke 3 (44.8%), the most types of surgery are stabilization, fusion, discectomy, laminectomy and osteotomy (56.9%). The duration of surgery was mostly 180-240 minutes (46.6%) with an average duration of surgery of 257 minutes, the average amount of bleeding was 884.5 ml, the average preoperative Hb was 13.3g/dL, the average postoperative Hb was 8.8 g/dL. The average postoperative Hemoglobin decrease was 5.3 g/dL, patients who were given blood transfusions (87.9%) with an average of 2.9 bags per patient, the most common type of transfused blood was PRC (90.2%).

Keywords: Anemia, Postoperative Scoliosis, AIS

INTRODUCTION

In an effort to maintain, improve, prevent, treat and restore the health of both individuals, families or communities, the hospital carries out health service efforts. Quality services are services that can satisfy every user of health services by organizing health services in accordance with the code of ethics and service standards that have been set. In strengthening the health system, the Ministry of Health launched health reform which is realized in the form of 6 pillars of transformation in the health sector, namely primary service transformation, secondary service transformation (referral or hospital), health service system transformation, health financing system transformation, health human resources transformation and health technology transformation.

Based on medical record data from Soeharso Orthopedic Hospital in 2019, the number of spine surgeries was 479 patients, and of these 63 patients were postoperative scoliosis who entered the ICU. According to Yuniarta et al, (2021), in 2020 at the Soeharso Orthopedic Hospital the number of postoperative scoliosis patients was 52 who entered the ICU. The highest amount of postoperative scoliosis bleeding was 751 - 1500 ml (38.5%). The highest decrease in Hb levels after scoliosis surgery was 2-4 g/dL, which was 44.2%. Patients who received blood transfusions after scoliosis surgery were 48 patients out of a total of 52 patients (92.3%), of the 48 patients who received blood transfusions, 17 (40.4%) patients received transfusions>3 bags. Based on the ICU room report in June there were 9 postoperative scoliosis patients with anemia who entered the ICU, 7 patients were placed on ventilators for indications of anemia and bleeding >30% EBV. Based on the above phenomenon, the researcher is interested in conducting a study on the Anemia Overview of Postoperative Scoliosis in the ICU of Soeharso Orthopedic Hospital.

METHODOLOGY

The classification in this study is a retrospective descriptive study, a descriptive study is a study that discusses one or more variables separately, one-by-one, but does not examine the relationship between these variables, In observational studies, researchers observe the situation including enumerating / measuring sample members without intervening in any way with them, (Harlan &Sutjiati, 2022). The types of descriptive studies include case studies, case series, and surveys using observational methods with subjects observed by looking at past conditions. Using a cross sectional study design, namely observational research where the method of collecting data on independent variables and dependent variables is carried out once at the same time. Not all subjects were examined on the same day or time and the independent and dependent variables were assessed only once. Risk factors and effects are measured according to their state or status at the time of observation, so there is no follow-up. (Harlan &Sutjiati, 2022). The population in this study was medical record data of postoperative scoliosis patients admitted to the ICU of the Soeharso Orthopedic Hospital in the period January 1, 2022 to December 31, 2022. Sampling with total sampling. The sampling technique uses inclusion criteria, namely medical records of anemic patients after scoliosis surgery, the first operation and being treated in the ICU. Exclusion criteria are medical record data for anemic patients after scoliosis surgery with hemophilia and spondylitis.

RESULTS AND DISCUSSION

The following are the results of the research and discussion

1. *Characteristics of Respondents*

a. *Age*

Table 1. Age characteristics

Age	Frequency	Percentage
12-16 Years	25	43.1
17-25 Years	31	53.4
26-35 Years	1	1.7
>35 Years	1	1.7
Total	58	100

The results of our study showed that the majority of patients were aged 17-25 years as many as 31 patients (53.4%), with the youngest age being 12 years and the oldest age being 37 years. The above results are in accordance with the results of research by Shirasawa et al. (2023) which states that scoliosis patients who performed posterior spinal fusion (PSF) were mostly 17.6 years old on average. Researchers have the opinion that scoliosis surgery performed when the patient's bones are mature is expected to avoid loose implants because elongated bone growth is not progressive like children's age.

b. *Gender Characteristics*

Table 2. Gender characteristics

Gender	Frequency	Percentage
Male	11	19
Female	47	81
Total	58	100

The results of the study we found that the gender of patients was mostly female (81%), while in previous studies according to Yuniarta et al (2021), most scoliosis patients who had surgery at the Soeharso Orthopedic Hospital in 2020 were female, namely 86.5%. The results of this study are in accordance with the results of research by Jamnik et al. (2023) which states that the most scoliosis patients are women, namely 79.2% of the total 1380 AIS patients studied. This researcher assumes that women experience more scoliosis due to hormonal factors and women's bone structure has lower strength compared to the strength of the male bone structure so that women are easier to experience scoliosis and the degree of curvature increases faster.

Postoperative Scoliosis

a. *Types of scoliosis*

Table 3. Types of scoliosis

Types of scoliosis	Frequency	Percentage
Juvenille	3	5.2
AIS	52	89.7
Adult	1	1.7
Congenital	2	3.4
Total	58	100

The results of the research that we got the most types of scoliosis were Adolescent Idiopathic Scoliosis (AIS) as much as 89.7% while 3 patients (5.2%) were juvenile

idiopathic scoliosis, 1 patient (1.7%) adult idiopathic scoliosis and 2 patients (3.4%) were congenital scoliosis. This is in accordance with the opinion of previous research Yuniarta et al (2021) which states that scoliosis patients who operated at the Soeharso Orthopedic Hospital in 2020 were the type of idiopathic scoliosis, namely 76.9%, Adolescent Idiopathic Scoliosis. Meanwhile, researchers have the opinion that the type of idiopathic adolescent scoliosis is the most common type of scoliosis because at that age the bones are at the peak of their growth and the child's activities are still very active, so that if there are symptoms of scoliosis, the spine will bend very quickly.

b. *Lenke Classifications*

Table 4. Lenke Classifications

ke Classifications	Frequency	Percentage
Lenke 1	12	20.7
Lenke 2	3	5.2
Lenke 3	26	44.8
Lenke 4	4	6.9
Lenke 5	6	10.3
Lenke 6	7	12.1
Total	58	100

The results of the study that we got the average patient who performed scoliosis surgery had a Lenke 3 classification (44.8%), other results were Lenke 1 by 20.7%, the least Lenke 2 was 5.2%. These results are not in accordance with research from Chan et al. (2023) which states that 158 patients (44%) of 357 AIS patients with scoliosis surgery using the PSF method are with Lenke 1 classification. In this case the researcher has the assumption that the Lenke classification is different in PSF surgery because the Lenke classification of each scoliosis varies greatly which is prioritized for surgery is the large angle of scoliosis, so the Lenke classification that is operated on is not the same in number in each country.

c. *Types of Scoliosis Surgery*

Table 5. Types of Scoliosis Surgery

Types of Scoliosis Surgery	Frequency	Percentage
stabilization, fusion.	3	5.2
stabilization, fusion, discectomy, laminectomy,	12	20.7
stabilization, fusion, discectomy, laminectomy, osteotomy.	33	56.9
stabilization, fusion, discectomy, laminectomy, osteotomy, facetectomy.	10	17.2
Total	58	100

The results of the study that we got for the most types of scoliosis surgery were 56.9% were stabilization, fusion, discectomy, laminectomy, osteotomy. This is not in accordance with research from Schlager et al. (2023) which states that in the surgery of Lenke 3 scoliosis patients who performed 42% resection, 46% discectomy, 53% flavectomy, grade 1 Schwab osteotomy was performed 100% in thoracal 10, 75% in thoracal 4, facetectomy combined with flavectomy 73% were performed on rigid / stiff and long curves. From the above results, the

researcher has the opinion that the type of surgery in scoliosis cases is adjusted to the condition of the spinal curvature, namely the magnitude of the angle, the rigidity of the curve and the maturity of the bone.

d. *Duration of surgery*

Table 6. Duration of surgery

Duration of surgery	Frequency	Percentage
<180 minute	9	15.5
180 – 240 minutes	27	46.6
241– 300 minutes	9	15.5
301– 360 minutes	12	20.7
>360 minute	1	1.7
Total	58	100

The results of the research we got from the duration of scoliosis surgery were 180-240 minutes, namely 27 patients (46.6%), while the fastest operation time was 60 minutes, the longest operation was 420 minutes, namely in a 19-year-old male patient with AIS Lenke 3, These results are less in accordance with research from Yuniarta et al (2021) which states that scoliosis patients at the Soeharso Orthopedic Hospital in 2020 the average time for scoliosis surgery is 257 minutes. This result is in accordance with the statement of Syundyukov et al. (2023) that the average time to perform open surgical correction (OSC) is 266.6 minutes. This can be assumed by researchers that the duration of surgery for scoliosis correction varies due to many influencing factors such as surgical techniques from posterior or anterior, the number of bone segments operated on and the angle of scoliosis.

e. *Amount of Bleeding*

Table 7. Amount of Bleeding

Amount of Bleeding	Frequency	Percentage
< 750 ml	31	53.4
750-1500 ml	19	32.8
1501-2000 ml	6	10.3
>2000 ml	2	3.4
Total	58	100

The results of our study obtained for the amount of intraoperative scoliosis bleeding averaged 884.5 mL, the most was <750 mL, a total of 31 patients (53.4%). The most bleeding was 3000 mL, in a 37-year-old female respondent with adult scoliosis Lenke 1. These results are not in accordance with research from Yuniarta et al (2020) which states that scoliosis patients who operated at the Soeharso Orthopedic Hospital in 2020 with the most intraoperative bleeding was 750 - 1500 mL, namely 38.5%. This result is in accordance with the statement of Shirasawa et al. (2023) which states that the total blood loss for posterior spinal fusion (PSF) surgery is 756.5 mL In this case the researcher has the opinion that intraoperative bleeding is influenced by many factors including the age of the patient, the older the patient's age, the harder the bone and the stiffer the angle of scoliosis so that the more difficult the correction is, resulting in more bleeding.

. *Anemia of Postoperative Scoliosis*

a. *Preoperative Hb levels*

Table 8. Preoperative Hb levels

Preoperative Hb levels	Frequency	Percentage
11 – 13 g/dl	25	43.1
>13 g/dl	33	56.9
Total	58	100

The results of the study that we got for the highest number of preoperative Hb levels of scoliosis were > 13 g / dL, namely 33 patients (56.9%), with an average preoperative Hb of 13.3 g / dL, other results of this study were the highest Hb level was 15.5 g / dL as many as 2 patients and the lowest Hb level was 11.2 g / dL This is in accordance with research from Chan et al. (2023) which states that the average preoperative Hb level of PSF in AIS scoliosis patients is 13.7 g / dL. In this case the researcher has the opinion that the preoperative Hb level of scoliosis should be normal because this operation is very risky for a lot of intraoperative bleeding, if before surgery anemia has occurred it will cause intraoperative and postoperative complications

b. *Postoperative Hb Levels*

Table 9. Postoperative Hemoglobin Levels

Postoperative Hb levels	Frequency	Percentage
6.5 – 8.0g/dl	17	29.3
8.1 – 9.5 g/dl	20	34.5
9.6 – 11g/dl	17	29.3
>11 g/dl	4	6.9
Total	58	100

The results of our study showed that the highest postoperative Hb level was 8.1-9.5 g/dL in 20 patients (34.5%) with an average of 8.8 g/dL. Other results of this study were the highest postoperative Hb level was 11.7 g/dL as many as 2 patients (3.4%), the lowest Hb level was 6.8 g/dL as many as 1 patient (1.7%). This is not in accordance with research from Chan et al. (2023) which states that the average postoperative Hb level of PSF is 10.6 g/dL for AIS patients and 10.5 g/dL for Adult Idiopathic Scoliosis. In this case, the researcher has the opinion that postoperative Hb levels in scoliosis decrease due to intraoperative bleeding and things that reduce the occurrence of a decrease in postoperative Hb levels, namely by preventing severe bleeding in intraoperative scoliosis.

c. *Decrease in Hb Levels*

Table 10. Decrease in Hb Levels

Decrease in Hb Levels	Frequency	Percentage
< 2 g/dL	2	3.4
2– 4 g/dL	22	37.9
4.1 – 6 g/dL	29	50.0
> 6 g/dL	5	8.6

Total	*58*	*100*

The results of the study we got for the average decrease in Hb levels after scoliosis surgery were 5.3 g / dL, the highest amount of decrease in Hb levels was 4.1 - 6 g / dL which was 29 patients or (50%), while the highest decrease in Hb levels was 7.4 g / dL occurred in female patients 16 years with AIS Lenke 2, the lowest decrease was 1.4 g / dL. This result is in accordance with the statement of Chan et al. (2023) which states that the reduction in postoperative Hb levels of PSF scoliosis is 3.1 g / dL for AIS patients and 2.5 g / dL for adult idiopathic scoliosis patients. In this case, researchers have the opinion that the decrease in Hb levels is strongly influenced by the amount of intraoperative bleeding and preoperative Hb levels

a. *Administration of Blood Transfusions*

Table 11. Administration of Blood Transfusions

Blood transfusions	*Frequency*	*Percentage*
Transfusions	*51*	*87.9*
Not. Transfusion	*7*	*12.1*
Total	*58*	*100*

The results we obtained for the number of patients who received blood transfusions were 51 patients (87.9%) out of a total of 58 patients. This result is not in accordance with the statement of Manuel et al. (2023) which states that 27% of 48 patients who performed single fusions, received blood transfusions while 73% of 41 patients who performed bipolar fusions received blood transfusions. In this case, the researcher has the opinion that the provision of blood transfusion is related to the amount of blood volume lost during surgery and also related to the techniques and instrumentation used in surgery

b. *Amountblood transfusions*

Table 12. Amount blood transfusions

Amount blood transfusions	*Frequency*	*Percentage*
1 - 2 bag	*27*	*52.9*
3 – 4 bags	*16*	*31.4*
5 – 6bags	*5*	*9.8*
> 6 bags	*3*	*5.8*
Total	*51*	*100*

The results of the study we obtained for the highest number of blood transfusions of 1 - 2 bags, a total of 27 patients (52.9%), with an average of 2.9 bags of transfusion from a total of 152 bags of blood given to 51 postoperative scoliosis patients. These results are in accordance with Nissen et al (2017) who stated that 64 patients after scoliosis surgery 24 patients (38%) were given 2 bags of transfusion per patient. In this case the researcher has the opinion that the number of bags in giving blood transfusion depends on the amount of decrease in Hb levels in

the patient and the amount of bleeding during surgery. Of the 58 patients who underwent scoliosis surgery, there were 7 patients (11.1%) who did not receive blood transfusion.

c. *Types of Blood Transfusion*

Table 13. Types of Blood Transfusion

Types of Blood Transfusion	Frequency	Percentage
PRC	46	90.2
PRC, TC, FFP	5	9.8
Total	51	100

The results of our study for the type of blood transfusion given to postoperative scoliosis patients were mostly PRC, namely 46 bags (90.2%) with an average of 0.9% bags per patient. This is not in accordance with research from Ahlers et al. (2023) which states that 12% of patients out of 172 postoperative scoliosis patients get PRC transfusion on average 11.5 mL / kg of patient body weight and at the time of intraoperative 157 patients (91%) get PRC transfusion of 4 mL / kg of body weight. In this case, the researcher has the assumption that the need for red blood cell transfusion depends on the percentage of intraoperative and postoperative Hb reduction.

CONCLUSION

From the results of this research we can conclude that the most postoperative scoliosis patients admitted to the ICU at the Soeharso Orthopedic Hospital are women with a ratio between women and men is 4.3: 1, the average age of surgery is 17 years old. The most common type of scoliosis is Adolescent Idoipatic Scoliosis (AIS) as much as (89.7%). The average duration of time used for scoliosis surgery is 236.4 minutes with an average amount of bleeding is 884.5 mL, the most types of surgery are stabilization, fusion, discectomy, laminectomy and osteotomy, the most Lenke classification is Lenke 3, in laboratory examinations found the average preoperative Haemoglobin (Hb) level is 13.3 g/dL, the average postoperative Hb is 9.04 g/dL, with an average decrease in Hb levels of 4.3 g/dL. The provision of blood transfusion in postoperative scoliosis patients was 87.9%, with an average of 2.9 bags of PRC blood, 0.19 TC and 0.19 bags of FFP.

SUGGESTION

Hopefully other researchers can develop better research, further research of a correlative, analytical or experimental type so that it can produce more varied research results and of course can improve the quality of hospital services in general and the quality of nursing services in particular. This research can be used as a comparison, support or reference source for other researchers who conduct research similar to this research.

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