



EVALUATION OF PREOPERATIVE ANEMIA PREVALENCE IN ELECTIVE MINOR SURGERY IN CHILDREN

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Abstract: The incidence of anemia and its association with postoperative complications in pediatric patients undergoing elective minor surgery are unknown. This study aims to determine the prevalence of anemia and its impact on postoperative complications in children undergoing elective minor surgery under general anesthesia. The preoperative complete blood count data of ASA I-II patients aged 1-18 years, for whom the pediatric surgery department planned an elective minor surgery under general anesthesia between January 1, 2019 and December 31, 2019, were evaluated retrospectively. The frequency of patients with abnormal hemoglobin values, the influence on preoperative treatment, the perioperative blood requirement and the complications were evaluated. Based on the specified inclusion interval, 851 of 3142 patients (784 Turks, 67 immigrants) met the inclusion criteria. It was observed that 24.38% of these patients had varying degrees of anemia (1.72% was rated as severe anemia). In addition, it was found that the operations of patients with anemia were not postponed and no additional assessment was required from the patients. It was found that the prevalence of anemia between Turkish patients and immigrant patients is similar. No complications were observed in the patients during the perioperative period. We found that the preoperative complete blood count test has limited value in patient management in children undergoing elective minor surgery and the prevalence of anemia in our area is quite high. Instead of routine laboratory tests, a careful medical history and physical examination are sufficient to determine the preoperative suitability of the pediatric patient before elective minor surgery.

Keywords: Prevalence, Anemia, Preoperative blood test, Elective minor surgery, Pediatric surgery

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1. Introduction

Anemia is defined as a decrease in red blood cells, or the concentration of hemoglobin in the blood, that affects motor and cognitive functions in children. According to the World Health Organization, the worldwide prevalence is estimated at 24.8%. (WHO, 2011; WHO, 2015).

Children are particularly at risk as iron deficiency anemia, rapid growth, and inadequate iron intake with insufficient nutritional support are the most important issues in this group (Somy et al., 2019). In Turkey, it has been reported that the frequency of anemia varies between 2-50% in children (Karaman et al., 2013; TARDPAÇG, 2013). Since complete blood count is one of the most frequently used diagnostic tests in children admitted to hospital, anemia of various degrees occurs in practice.

Preoperative laboratory tests are considered as an integral part of the pre-anesthetic evaluation. Although routine screening tests do not play a significant role in treating patients with elective surgery, these tests are done routinely even when they rarely detect an unexpected disease. On the other hand, an abnormality in

the test results does not affect the perioperative management or outcome, and these tests are also performed for elective minor surgeries (Michota et al., 2004; Ajimura et al., 2005).

The usefulness of routine testing is being challenged as unnecessary testing increases the cost of surgical care without providing assurance of legal liability and patient comfort. Some preoperative tests are done without considering the patient's age, medical history, severity of surgery, or cost considerations. Patients can benefit from some tests in case they need post-operative care in the intensive care unit and provide baseline values for later comparisons. The complete blood count is most frequently performed with the desire to detect anemia and other blood diseases in all age groups. The most common finding in patients without complaints is anemia, but it may not change surgical decisions, especially in minor surgeries (Mallick, 2006).

The aim of this study was to elucidate the prevalence of preoperative anemia in children presenting to our hospital for minor surgery and to examine the difference between immigrants and our citizens.



2. Material and Methods

The local ethics committee approval has been granted and all procedures were applied in compliance with the principles of the Declaration of Helsinki. This retrospective analysis was conducted between 31 December 2018 and 31 December 2019. ASA I-II patients aged 1-18 years who had minor elective surgery by pediatric surgery under general anesthesia and children who did not have preoperative blood test were included in the study. Children who underwent ASA III-IV, emergency surgery, or major surgery were not included in the analysis. Medical records were reviewed for type of surgery, preoperative hemoglobin levels, perioperative surgery, anesthesia-related issues, and demographics. Patients' hemoglobin levels were categorized based on their age and hemoglobin level as stated in World Health Organization (WHO, 2011; WHO, 2015) (Table 1).

Table 1. Classification of anemia in children according to hemoglobin values, gr/dL

Age	Normal	Mild	Moderate	Severe
12-59 M	>11	10-10.9	7-9.9	<7
5-11 Y	>11.5	11-11.4	8-10.9	<8
12-14 Y	>12	11-11.9	8-10.9	<8
≥15 Y, NPF	>12	11-11.9	8-10.9	<8
≥15 Y, ML	>13	11-12.9	8-10.9	<8

M=months, Y= years, NPF= non-pregnant female, ML= male

2.1. Statistical Analysis

Statistical analyses were performed with SPSS 23 Windows (Statistical Package for Social Sciences, Armonk, NY, USA) package software. Continuous data were expressed in mean ± standard deviation and independent t-test, while categorical data were expressed in numbers (percentages). The value of P<0.05 was considered statistically significant.

3. Results

A total of 3142 pediatric patients were operated on in our hospital during the study period. Patient demographics are shown in Table 2 and preoperative hemoglobin levels are shown in Table 3. Eight hundred fifty one patients had minor surgery and 39 Turkish citizens did not have a laboratory test before surgery. The prevalence of anemia was 24.38% (n=198), and 1.72% (n=14) patients had severe anemia (hemoglobin levels were lower than 7 gr/dl) in our study group.

All patients were discharged after 24-48 hours of surgery. There was no need for blood transfusion in any patient. There was no statistical difference in anemia between refugees (12.84 ± 2.38) and Turkish citizens (12.68 ± 2.15). (P=0.56).

4. Discussion

This study showed that preoperative anemia was observed in 24.38% of children admitted to our facility for minor surgery. However, none of the patients had a complication of anemia in the perioperative period. Anesthesiologists ensure adequate oxygen delivery to the vital organs during surgical procedures. ASA task force has emphasized the evaluation of vital organs in perioperative period for adequate oxygenation and perfusion.

Table 2. Demographic Data (n=851)

Characteristics	n (%)
Sex	
Male	729 (85.7)
Female	122 (14.3)
Age	
12-59 months	365 (42.89)
5-11 years	292 (34.31)
12-14 years	72 (8.46)
≥15-year non-pregnant female	39 (4.58)
≥ 15-year male	83 (9.75)
Nationality	
Turkish	784 (92.13)
Refugees	67 (7.87)
ASA	
I	738 (84.68)
II	113 (15.31)
Surgery Type	
Circumcision	399 (46.88)
Inguinal hernia	243 (28.55)
Pilonidal sinus	89 (10.7)
Circumcision and inguinal hernia	54 (6.34)
Circumcision and undescended testis	40 (4.71)
Frenulum	18 (2.11)
Meatoma	5 (0.58)
Hydrocelektomia	3 (0.35)

Table 3. Pre-operative hemoglobin levels

Age	Normal	Mild	Moderate	Severe
	614 (75.61) n (%)	85 (10.46) n (%)	99 (12.49) n (%)	14 (1.72) n (%)
12-59 M	283	35	32	4
5-11 Y	223	14	49	4
12-14 Y	48	10	6	3
≥15 Y, NPF	21	4	6	1
≥15 Y, ML	39	22	6	2

M=months, Y= years, NPF= non-pregnant female, ML= male

Electrocardiography, blood pressure, heart rate, oxygen saturation, and urine output are the conventional preoperative tools of monitoring (Basel et al., 2018). Advances in surgical technology, the availability of sophisticated instruments, and monitoring tools have

improved surgery and anesthesia by making the patient's physiology less complicated and threatening, and allowing early and safe recovery. Nevertheless, a "routine" blood testing policy before operations has become an integrated part of surgical and anesthetic practice (Basel et al., 2018).

Since complete blood count (CBC) is one of the most frequently used diagnostic tests in children admitted to hospital, anemia of varying degrees is common in practice. Identification and treatment of the disease-causing anemia are more important than the anemia itself (Somy et al., 2019). It is appropriate to use a lower limit according to age in the diagnosis of anemia. According to the results of this study we found that the prevalence of anemia in our region was almost 25%. We did not differentiate the cause of the anemia, but it is logical to believe that the most common cause of anemia in our study population, as in the published literature, was iron deficiency anemia (IDA). The most common cause of anemia in all age groups, particularly in infants and children, was IDA (Lin, 2019). The IDA prevalence in the population exceeds 50% in parts of the world where socioeconomic level is low. The lowest rate of IDA was found in California (3.4%), and the highest rate was found in Nigeria (79.1%) (TARDPAÇG, 2015; Somy et al., 2019). In Turkey, it has been reported that the frequency varies between 2-50% (TARDPAÇG, 2015).

According to the Turkish Anesthesiology and Reanimation Society's Preoperative Assessment Guideline, there is no need for routine preoperative testing in ASA-1 patients undergoing minor surgery (TARDPAÇG, 2015). Traditionally, patients without CBC are not accepted to general anesthesia for legal and safety reasons. In this analysis, we found that 39 patients who underwent a minor surgery under general anesthesia had no preoperative blood count and none of these operations were postponed.

Interestingly, four patients with severe anemia before surgery were not referred to the pediatrician or the surgery was postponed as patients usually came to the hospital on the day of surgery or the day before minor surgeries. These types of surgery can be considered relatively safe and bleeding has not been observed. On the contrary, surgeons ignored abnormal laboratory results in more than half of cases (Soares et al., 2013), which could have serious legal consequences. These could help explain why minor surgeries were performed with these conditions. Adenekan et al. (2012) found that routine laboratory tests had minimal impact on the management and outcome of pediatric orofacial cleft surgery.

The factors influencing the indiscriminate ordering of preoperative tests are not well known. Some assumptions are insecurity during clinical evaluation, distrust of physicians in the surgical outcomes and cases published in the literature. (Kannaujia et al., 2020). Mirza et al. (2018) stated that day-case surgeries could be safely performed with hemoglobin levels over 8 g/dL.

In our study, 14 patients had surgery under these levels safely. Hemoglobin levels less than 6 g/dL is considered a valid trigger for transfusion in the presence of symptoms of anemia. Current expert consensus guidelines recommend taking into consideration the individual patient's clinical status along with an optimum hemoglobin target (TARDPAÇG, 2015). In general, recommendations for pediatric patients (excluding neonates) suggests that a hemoglobin threshold transfusion target of 7g/dL (Goel et al., 2016; Goobie et al., 2019) is appropriate in a hemodynamically stable well-compensated patient and that, in general, given a hemoglobin concentration of >9g/dL, red blood transfusion is unnecessary and inappropriate (Ioannou et al., 2019).

Turkey has been hit by a large wave of immigration from the Middle East and particularly from Syria. We tried to investigate the influence of refugees on the prevalence of anemia in our cohort. Although the proportion of immigrants (7.87%) was not high enough, there was no statistical difference to Turkish citizens. In addition, only one patient had severe anemia. The prevalence of anemia among immigrants can be high due to nutritional deficiencies.

The costs for preoperative blood tests are a separate burden on the social security system. Although a complete blood count alone with 2.85 TL causes low costs, due to the difficulties (Çelikel et al., 2019) in the pediatric age group, hemostasis and simple biochemical tests are also required during blood collection. These costs, which total 33.73 TL for a patient, make up about 50% of the cost of a circumcision operation. Indeed, determining the prevalence of preoperative anemia is critical to inpatient optimization for major surgical procedures; it seems unnecessary in minor surgeries. Nieto et al. (Nieto et al., 2017) showed that preoperative tests did not significantly impact elective pediatric cardiothoracic surgery decision-making. Tests should be clinically ordered to reduce costs and patient discomfort. Implementation of patient blood management programs in the adult surgical population has clearly shown that it improves outcomes and reduces costs (Meyer et al., 2020), but there is still a lack of evidence in pediatric surgery.

Venous interventions such as blood draw may look like minor procedures, but children can find them painful and frightening (Çelikel et al., 2019). Painful experiences for children with blood draws and other invasive procedures can have negative consequences, such as extreme anxiety during future operations and extreme physiological reactions during the current procedure. Additionally, Gerçeker et al. (2018) found that 18% of children between 4-10 years old who had difficulty in venipuncture were related to higher anxiety levels. Previous painful experiences, fear of needles, and anxiety continue into adulthood, and this situation can cause an exacerbated pain response and result in the avoidance of medical procedures. Basel et al. stated that no laboratory

tests were indicated for healthy children undergoing a procedure with minimal blood loss anticipated (Basel et al., 2018).

5. Conclusion

In relation to the results of this study, it can be concluded that preoperative anemia was common in infants and children eligible for minor surgery at our facility. A detailed and careful physical examination in patients with ASA 1-2 minor pediatric surgery can avoid the need for blood draws, which can induce anxiety and exaggerated physiological responses in children. This can increase child and family comfort and reduce laboratory costs without compromising the safety and quality of care.

Limitations

Our sample size may not be sufficiently powered to produce statistically significant results. In addition, the unique patient population at a single facility, the retrospective design of the study, and various types of minor surgeries can be identified as additional barriers.

Author Contributions

All authors have equal contributions and authors reviewed and approved the manuscript.

Conflict of Interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

Ethical Approval/Informed Consent

The ethics committee approval has been granted (2011-KAEK-25 2020/11-08) and all procedures were applied in compliance with the principles of the Declaration of Helsinki.

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