Indications of blood transfusion in Children; An experience of a single peripheral general hospital in Al-Muthanna, Iraq.

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Background: Transfusion of red blood cells (RBCs) can be life-saving in patients with severe blood loss or patients with severe chronic anemia. On the other hand, RBC transfusion has significant risks, including volume overload, transmission of infectious agents, transfusion reactions, and various immunologic consequences including graft-versus-host disease.
Aims of study: To evaluate the indications of blood transfusion in a peripheral general hospital.
Methods: This cross-sectional study included 40 pediatric patients (age less than 15 years) who were admitted to the pediatric ward at Al-Khidr General Hospital, Al-Muthanna health directorate, Al-Muthanna governorate, south part of Iraq, in the period from January 1st, 2018 to March 31st 2019. All patients required blood transfusion. All demographic, clinical and laboratory data were registered in the study sheet. All patients were followed till the ultimate come (discharge improved or died).The data collection was filled by the study researchers themselves.
Results: The age ranged from 9 days (Galactosemia) to 13 years, with a mean of (6) years. The main complaint was pallor in (45%). Undiagnosed anemiawas the major identified cause in 16 patients (40%). The Hbranged (1.4 – 8 gm/dl), the mean was 5.0 gm/dl. Seven patients were below 4 months of age (17.5%), two of them received transfusion without logical indication. Eighty-two percent of patients (33 patients) were older than 4 months of age, of whom 11 patients (27.5%) received transfusion without logical scientific bases.
Conclusions: The study showed major pitfalls in the management of patients with anemia. The main obstacles to implementation are a lack of trained staff.
Keywords: Red Blood Cells, transfusion, pallor, anemia, children.

I.   Introduction:

The principal rationale behind RBC transfusion is to provide sufficient cells to prevent or reverse tissue hypoxia due to limited oxygen delivery. Although there are limited data on the hemoglobin (Hgb) level required for sufficient tissue oxygenation in normal children, data from animals studies and clinical observations of children with sickle cell disease suggest that a hematocrit of 20 percent (which corresponds to a Hgb of approximately 6.7 g/dL) can be tolerated in otherwise healthy children without adverse consequences. [1-3]

In both children and adults, clinicians have sought a "transfusion trigger," an absolute Hgb or hematocrit value below which the patient needs RBC transfusion. [4] However, assigning an absolute level is difficult since the Hgb level at which transfusion is required varies with the clinical setting (eg, acute or chronic) and physiologic status of the patient. In addition, the physiologic response to anemia in children is different from adults. In children, dyspnea, impaired consciousness, and other symptoms of hemodynamic compromise may not appear until the Hgb is <6 g/dL (hematocrit <18 percent) if the anemia has developed slowly. In stable, critically ill children, a Hgb threshold of 7 g/dL (hematocrit of 21 percent) has been used to decrease transfusion requirements without increasing adverse outcomes. [1]

There are few studies of RBC transfusion requirements in children except in certain specific patient populations such as children with sickle cell disease and premature neonates. As a result, guidelines for RBC

transfusion in infants and children generally have been established by taking standards from adult patients and modifying them according to clinical experience. [5-7] General RBC transfusion guidelines are based principally upon patient's age and clinical status. [5]

The aim of this analysis was to study the clinical and demographic variables of patients receiving blood transfusions in pediatric ward in a general peripheral hospital, including the indications and pitfalls.

Patients and methods: This cross-sectional study included 40pediatric patients (age less than 15 years) who were admitted to the pediatric ward at Al-Khidr General Hospital, Al-Muthanna health directorate, Al-Muthanna governorate, south part of Iraq, in the period from January 1st, 2018 to March 31st 2019. The patients were admitted for pallor or any other complaint and during their hospitalization, they required blood transfusion. All demographic, clinical and laboratory data were registered in the study sheet. All patients were followed till the ultimate come (discharge improved or died). All the corresponding times were recorded and admitted to the entry sheet. The required tests as per the clinical condition were ordered accordingly. The decision of blood transfusion was made by the resident physician.The indications and complications were reported.All the transfusions were packed red blood cells.

The data collection sheet was modified based on a published survey. [6]The data collection was filled by the study researchers themselves.Data were processed using SPSS (Statistical package for the social sciences) for Mac. Qualitative data are expressed as frequency and percentage, quantitative data as mean. [7]

II.   Results:

Eighty-two percent (33 patients) were more than 4 months in age, in consideration to other7 patients (17.5%) were less than 4 months of age. The youngest patient was 9-day-old who was suspected of having Galactosemia, while the oldest patient (13) years, the meanage of (6) years.

Distribution of the 40 patients Admitted at Al-Khidr general hospital according to age

Age group	Frequency	Percent
less 4 months	7	17.5
More or equal 4 months	33	82.5
Total	40	100.0
Minimum (9) days	**Mean** (6) years	
Maximum (13) years	**Std. Dev.** (2.1) years	

Eighteen patients (45%) presented with a complaint of pallor. Other complaints in order of frequency were shortness of breath in 9 patients (22.5%), and Jaundice in 6 patients (15%),

Distribution of the main complaint of 40 patients.

Item	Frequency	Percent
Pallor	18	45.0
Shortness of breath	9	22.5
Jaundice	6	15.0
Bleeding	3	7.5
Others	4	10.0
Total	40	100.0

Undiagnosed anemia was the most frequent diagnosis in 16 patients (40%)and the decision was mainly dependent on the clinical condition that indicated transfusion prior to diagnosis. Five patients (12.5%) received blood transfusion in pediatric ward were having Iron deficiency Anemia. Another five patient (12.5%) were having anemia of chronic disease.

Four patients (10%) were diagnosed with hemolysis, three with RH incompatibility. Sepsis was reported in two patients (5%). The diagnosis was established in the hospital according to the available limited investigations in the periphery hospital.

Distribution of the presumptive diagnosis for the 40 patients.

Item	Frequency	Percent
Undiagnosed	16	40.0
Iron deficiency anemia	5	12.5
Anemia of chronic disease	5	12.5
Hemolytic	4	10.0
Sepsis	2	5.0
Malignancy	2	5.0
Others	6	15.0

Total	40	100.0

Among the study group; the minimum Hbrecorded is 1.4 gm/dl, the maximum is 8 gm/dl while the mean was 5.0 gm/dl. The mean WBC count is 12.000/cmm and the mean platelets was 301.000/cmm.

Hematological parameters of the study group

Item	Minimum	Maximum	Mean	Std. Dev.
Hb level (gm/dl)	1.4	8.0	5.0	21.9
WBC count (1000/cmm)	0.9	17.0	12.0	5.6
Platelet count (1000/cmm)	0.8	500.0	301.0	120.0

According to the national guidelines for transfusion, seven patients were below the age of 4 months (17.5%), two of them were transfused without scientific logical indication. The other 5 patients received transfusion either for Hb below 7 gm/dl or for symptomatic anemia (4 and 1 respectively). Eighty two percent of patients (33 patients) were older than 4 months of age; twentypatients (50%) received blood transfusion for Hb below 7 gm/dl with symptomatic anemia, two patients (5%) received transfusion for Hb below 9 gm/dl with impaired cardiopulmonary status. Unfortunately, 11 patients (27.5%) received transfusion without logical scientific bases. By this, the total number of patients who received blood transfusion without scientific base was 32.5% (13 patients).

Indications of transfusion of children in Al-Khidr general hospital

Indication	Frequency	Percent
Less than 4 months	**7**	17.5
• Hb < 7 gm/dl	4	10
• Hb < 8 gm/dl with symptomatic anemia	1	2.5
• No indication for transfusion	2	5
Older children	**33**	**82.5**
• Hb < 7 gm/dl with symptomatic anemia	20	50
• Hb < 9 gm/dl with cardiopulmonary disease	2	5
• No indication for transfusion	11	27.5
Total	**50**	**100.0**

III. Discussion:

Worldwide, transfusions of red blood cells are given to children for a wide range of indications, including anemia due to congenital or acquired disease, or blood loss from trauma, surgery, and/or frequent blood sampling. Red cell transfusion has significant risks, including volume overload, transmission of infectious agents, and various immunologic consequences including transfusion reactions. Many of these complications can be avoided with careful administration of red cell transfusions. [8]

The aim of this study was to highlight the main difficulties and pitfalls associated with blood transfusion indications and environment in a general hospital and among pediatric patients.Developing countries face considerable obstacles to ensuring a safe blood supply and safe blood transfusions. Because developing countries tend to have inadequate available blood supplies, they depend on family blood donors. [9]

There are many guidelines for blood transfusion, the most popular are these published by American Society of Anesthesiologists and other societies. [10-14] The current trend is pushing towards the restrictive strategy. Most publications are dividing the pediatric age group into two sections; below 4 months of age and more than 4 months of age, the latter being subjected to the same adult guidelines. In general, young children have lower hemoglobin concentrations than adults, the studied group had shown that 82.5% of children are more than 4 months of age. This was lower than 86% in a study from a tertiary center in Iraq. [6]

In this study, pallor was the main compliant seen in 45%, a figure more than that reported by Hasanein Ghali in Baghdad Medical City, Children Welfare Teaching Hospital (26%). [6]Bleeding was seen in the tertiary center study in 14%, while only one patient in the current study presented with a compliant of bleeding. The cases of bleeding are referred directly to a tertiary center from any peripheral hospital because of the availability of supportive care facilities. [6]

Regarding presumptive initial diagnoses, forty percent of cases were failed to reach a diagnosis initially, in comparison to 26% from a tertiary center in the same country. Centers are inclined to the restrictive strategy more than peripheral hospitals; the available staff and facilities stands as a supporting factor to spend longer time before deciding to transfuse patients. [6]Notably, 12.5% pf cases were diagnosed with Iron deficiency state which is not the case in Hasanein Ghali study where no case was reported to Iron deficient, the inclination is to treat with medication rather than blood transfusion. Peripheral hospitals are more liberal in treating such nutritional anemias, partly because of lack of experienced physicians. [6]

Around third of the study group received transfusion without scientific base, while 28% was reported

in Ghali study. [6] This difference is quite clear because of the availability of teaching staff in tertiary centers. It highlights the importance of educating the medical staff about the indications of transfusion and the importance of using the restrictive strategy of transfusions. Many measures should be undertaken before issuing blood transfusion. These measures are assessing the clinical status of the patients, deciding if he/she is candidate for blood transfusion in the ER, checking his vitals before transfusion, and checking his blood group and the compatibility.

IV. Conclusion:

The burden of anemia and RBC transfusions in the pediatric population are significant. The current guidelines for pediatric blood transfusions are mainly based on available information regarding transfusions in adults. The study showed major pitfalls in the management of patients with anemia.

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