

## Pattern Of Pediatric Blood Transfusion In Hospital Setting

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### ABSTRACT

**Background;** Children are the main users of blood, and in resource- limited-settings they account for a high proportion of blood usage (16–67%), compared to about 5% reported from developed countries. Moreover, pediatric transfusion has unique aspects and is different from adults in relation to transfusion decisions, indications, doses, and frequency of adverse reactions, and this should be taken into consideration when evaluating blood transfusion in this age group.

**Aim and objectives;** assessment of frequency, indication and pattern of blood transfusion among children admitted to the pediatric medical department at Sayed Galal hospital, El-Hussin hospital and El-Galaa hospital.

**Subjects and methods;** This is a cross-sectional, descriptive study of sixty (60) admitted children who were received blood transfusion in the pediatric department, at Sayed Galal hospital, El-Hussein hospital and El-Galaa hospital. All studied children were subjected of full history taking. personal history, complaint, present history, history of sensitivity to drug, past medical history, past surgical history, family history, source of transfusion, indication for transfusion, blood component & blood bags number , Complete general and local examination& complete laboratory investigation ,CBC,ESR ,PT,PTT, INR, blood group, HB before& after transfusion

**Result;** The most frequent indication of blood transfusion in studied population was thalassemia in 40.0% followed by G6PD in 25.0%, autoimmune hemolytic anemia, acute hemorrhage and receiving oxygen treatment in 10.0% for each, and lastly severe decompensated anemia in 5.0%.. Studied population 11.7% of them developed complications during blood transfusion. The most frequent complications of blood transfusion in studied population was allergic reactions in 11.7% followed by febrile non-haemolytic transfusion reaction in 1.7% that was associated with rigors in 1.7% of cases.

**Conclusion;** There is statistically significant positive correlation between the higher number of blood transfusion and the greater increase in HB level after transfusion. While there was statistically significant negative correlation between the HB level before transfusion and the increase in HB level after transfusion..

**Keywords;** Blood transfusion, modern health-care systems, World Health Organization (WHO), pediatric medical department

## INTRODUCTION TO

Blood is a vital human tissue and a precious health resource, required to be adequately available, safe, correctly and rationally used and timely administered. **(Goodnough and Panigrahi, 2017).**

Blood transfusion is an essential component of modern health-care systems and when used appropriately, it saves lives, improves health conditions and enhances patient outcomes. However, improper or unnecessary use can increase the risk of serious, acute, and delayed adverse complications, and in underprivileged settings it places further strain on already limited health resources **(Moncharmont, 2019),( Klein, 2013).**

In recognition of its critical role in the patient management over a wide variety of medical conditions, blood and blood products are currently incorporated into the World Health Organization (WHO) model list of essential medicines **(World Health Organization, 2019)**

Access to safe and adequate blood supply remains a public health challenge in many countries, particularly in low resource settings . In high-income countries the average donation rate is 32.1/1000

population in comparison to 4.6/1000 population in low income countries, where about 80% of the world's population lives and has access to only 20% of the world's safe blood supply **(World Health Organization,2016),(Custer et al., 2018).**

In the Middle Eastern Region which is consisting of heterogeneous countries with different levels of development, the demand for blood transfusion is on the rise as a result of increased accessibility to more advanced medical and surgical procedures, expansion of aging population, and in children there is high prevalence of transfusion dependent  $\beta$ -thalassemia and sickle cell disease**(Haddad et al.,2018)** . Beside the efforts for strengthening the infrastructure and testing for transfusion transmissible infections, regular documented clinical review plays a vital role in monitoring and evaluation of clinical transfusion practices, optimization of blood use and consistent adherence to guidelines and standard operating procedures **(Roberts et al.,2016)** .

Children are the main users of blood, and in resource- limited-settings they account for a high proportion of blood usage (16–67%), compared to about 5% reported from developed countries **(Hassell et al., 2012),( McCormick et al., 2020).** Moreover,

pediatric transfusion has unique aspects and is different from adults in relation to transfusion decisions, indications, doses, and frequency of adverse reactions, and this should be taken into consideration when evaluating clinical blood transfusion in this age group (Goel et al., 2016),( Rai and Agrawal, 2016)Data on usage and pattern of blood transfusion is critical in order to promote rational use and this might help to conserve this scarce resource, especially in low- income settings where the gap between need and demand exists and blood requirement is highly unmet (Burnouf ,2019

- Patients were enrolled in the study after taking informed oral and written consent from their parents.
- Patient data confidentiality was preserved during all study procedures.
- The patient and parents has the right to withdraw the study any time.
- There was no conflict of interest regarding the study or publication.
- There is no financial support or sponsorship.
- We ensure that the participants are not physically or psychologically harmed during the study.

**The aim of the study was:**

assesment of frequency, indications and pattern of blood transfusion among children admitted to the pediatric department at Sayed Galal hospital, El-Hussin hospital and El-Galaa hospital during the period from January to may2024

**ETHICAL CONSIDERATION:**

- Ethical Scientific Committee of AL-Azhar University approved the study protocol

**sample size equation**

The sample size and power analysis was calculated using Epi-Info software statistical package created by World Health organization and center for Disease Control and Prevention, Atlanta, Georgia, USA version 2002. The criteria used for sample size calculation were as follows:

- Confidence limit 95%
- Accepted error 5%
- Power of the study 86 %

The sample size was found at N = 46 cases at least

### Inclusion criteria

1. Children were admitted and received blood transfusion in the pediatric department, at Sayed Galal hospital, El-Hussein hospital and El-Galaa hospital even the cause of indication
2. Ages from 4 month -16 years with both sex.

### Exclusion criteria

1. Children under 4 month
2. Children above 16 years
3. Hypersensitivity reaction

### PATIENTS AND METHODS

This is a cross-sectional, descriptive study of the all sixty (60) children who were admitted and received blood transfusion in the pediatric department, at Sayed Galal hospital, El-Hussein hospital and El-Galaa hospital during the period from January to may 2024

All patients were subjected to:

#### 1) Complete history taking:

- **Personal history:** name, age, sex.
- **Complaint:** eg pallor, jaundice, dark urine & its duration
- **Present history:** Analysis of the current patient complaint.
- **History of sensitivity to drugs.**
- **Past Medical history**

- **Past Surgical history:** history of previous operations
- **family history**
- **Blood groups**
- **Source of transfusion:** blood bank, donation
- **Indication for transfusion:** eg thalathemia, G6PD, acute hemorrhage
- **Blood component type:** eg plasma, red blood cells, and platelets.
- **Blood bag numbers**
- **Duration of transfusion**
- **Adverse effect**

#### 2) Complete physical examination

- **General examination:**
  1. **General condition .eg good, fair , bad**
  2. **Attitude in bed**
  3. **Complexion: pallor, icteric, cyanosed**
  4. **Vital measurement**
  5. **Anthropometric measurement**
- **Local examination:** liver, spleen, lymph node size

### 3) Routine laboratory investigations:

- Complete blood count (CBC). (Lozano& Badawi,2020)
- Erythrocyte sedimentation rate and C-reactive protein(Lozano& Badawi,2020)
- Liver and kidney functions.
- PT, PTT and INR. (Lozano& Badawi,2020)
- Blood group &Rh group

- Hb level before & after transfusion

### Statistical analysis

Data collected were reviewed and coding of the collected data was done manually. These numerical codes were fed to the computer where statistical analysis was done using the Statistic Package for Social Science Version 22 (SPSS 22) for windows.

#### A) Descriptive statistics:

- 1 – Quantitative data: were presented as mean and standard deviation (mean  $\pm$  SD)
- 2 - Qualitative data: were expressed as numbers and percentage

## RESULTS

Table (1):Clinico-demographic data of studied cases:

		No.= 60	
Age (years)	Range	0.5 - 14	
	Median [IQR]	4 [4]	
	Mean $\pm$ SD	4.6 $\pm$ 3.2	
		N	%
Sex	Male	38	63.3%
	Female	22	36.7%
Blood group	A	24	40.0%
	B	12	20.0%
	O	16	26.7%
	AB	8	13.3%
Type of Blood transfused	Packed RBCs	55	91.7%
	Irradiated blood	5	8.3%
Number of transfusions	1	2	3.3%
	2	36	60.0%
	3	22	36.7%

This table show the clinico demographic data of the studied cases

**Table (2):** Indication of blood transfusion in studied cases

		No.= 60	
		N	%
<b>Underlying disease</b>	Thalassemia	24	40.0%
	Autoimmune hemolytic anemia	6	10.0%
	G6PD	15	25.0%
	Acute hemorrhage	6	10.0%
	severe anemia (decompensated)	3	5.0%
	on oxygen ttt	6	10.0%

This table show The most frequent indication of blood transfusion in studied cases was thalassemia in 40.0% followed by G6PD in 25.0%.

**Table (3):** Hb level before and after blood transfusion:

		No.= 60
<b>Hemoglobin level before gm/dl</b>	Range	4 – 7
	Median [IQR]	5 [1.5]
	Mean ± SD	5.142± 0.808
<b>Hemoglobin level after gm/dl</b>	Range	9 – 11
	Median [IQR]	10.5 [1]
	Mean ± SD	10.472± 0.541
	<b>p- value</b>	<0.0001

The mean value of hemoglobin level before transfusion was  $5.142 \pm 0.808$  gm/dl. The mean value of hemoglobin level after transfusion % was  $10.472 \pm 0.541$  gm & p-value  $<0.0001$

**Table (4):** Complications of blood transfusion in studied cases

		No.= 60	
		N	%
<b>Complications categories</b>	Flushing	3	5%
	Rash	2	3.3%
	Fever	1	1.7%
	Rigor	1	1.7%
<b>total</b>		7/60	11.7

NB: some patients develop more than 1 complication

Among our studied cases 11.7% develop complications during blood transfusion. The most frequent complications of blood transfusion in studied cases was allergic reactions in 11.7% in the form of (flushing in 5% & rash in 3.3%) followed by febrile non-haemolytic transfusion reaction in 1.7% that was associated with rigor in 1.7% of cases.

**Table (5):** correlation between HB level increase and clinical data of the studied cases:

	HB level increase	
	r	P-value
<b>Age</b>	-0.018	0.891
<b>Hb level before transfusion</b>	-0.749**	<0.0001
<b>Hb level after transfusion</b>	0.134	0.307
<b>Number of transfusions</b>	0.341**	0.008
<b>BMI</b>	0.153	0.273

There is statistically significant positive correlation between the higher number of blood transfusion and the greater increase in HB level after transfusion. While there was statistically

significant negative correlation between the HB level before transfusion and the increase in HB level after transfusion.

### Discussion

Blood is a vital human tissue and a precious health resource, required to be adequately available, safe, correctly and rationally used and timely administered. (Goodnough et al., 2017).

Blood transfusion is an essential component of modern health-care systems and when used appropriately, it saves life, improves health conditions and enhances patient outcomes. However, improper or unnecessary use can increase the risk of serious, acute, and delayed adverse complications, and in underprivileged settings it places further strain on already limited health resources (Monchamont et al., 2019).

In recognition of its critical role in the patient management over a wide variety of medical conditions, blood and blood products are currently incorporated into the World Health Organization (WHO) model list of essential medicines. (Klein et al., 2013).

Moreover, pediatric transfusion has unique aspects and is different from adults in relation to transfusion decisions, indications, doses, and frequency of adverse reactions, and this should be taken into consideration when evaluating clinical blood transfusion in this age group (Rai et al., 2016).

The aim of this study was to assess the frequency, indication and pattern of blood transfusion among children admitted to the pediatric department at Sayed Galal hospital, El-Hussin hospital and El-Galaa hospital.

the current study included 60 children who received blood transfusion; 63.3% were males and 36.7% were females. Their age ranged between 4 months–16years with mean value of  $4.6483 \pm 3.220$ years.

In current study, regarding blood group of included children, 40% have blood group A, 26% have blood group O, 20% have blood group B and 13.3% have blood group AB. Most of included subjects received packed RBCs 91.7% while the remaining 8.3% received irradiated blood as they have autoimmune hemolytic anemia. Blood

transfusion was done at ward in 43.3% followed by intermediate care in 38.3% while 18.3% were done at ICU.

Our results agreement with **AL-Saqladi et al.(2021)** who found that The prevalence of the ABO/Rhesus D blood groups in the study cases were: O positive 55.4%, A positive 22.8%, A negative 7.4%, B positive 7.4%, O negative 4%, AB positive 2%, AB negative (1%). All blood group types were requested in this study except blood group B negative. In total, 88% were Rhesus D positive, and (12%) were Rhesus D negative. The most requested group was O positive (57.5%), followed by A positive (21.9%), and the least requested blood type was AB negative (0.6%).

Our results showed that the most frequent indication of blood transfusion in studied population was thalassemia in 40.0% followed by G6PD in 25.0%, autoimmune hemolytic anemia acute hemorrhage and receiving oxygen ttt in 10.0% for each, and lastly severe decompensated anemia in 5.0%.

Our results showed that 11.7% develop complications during blood transfusion. The most frequent complications of blood transfusion in studied population was allergic reactions in 11.7% in the form of

(flushing in 5% & rash in 3.3%) followed by febrile non-haemolytic transfusion reaction in 1.7% that was associated with rigor in 1.7% of cases.

Our results showed that the mean value of hemoglobin level before transfusion was  $5.142 \pm 0.808$  gm/dl. The mean value of hemoglobin level after transfusion % was  $10.472 \pm 0.541$  gm/dl and the mean value for change in hemoglobin level was  $5.330 \pm 0.678$  gm/dl.

Our results agreement with **Ughasoro et al.(2013)** who found that the mean Haemoglobin concentration (Hb) increase was 3.1g/dl and 12.8% of the recipients recorded an Hb increase of 5g/dl. The mean duration of transfusion was 4.6 hours and 59.7% of the transfusions exceeded the recommended four hours. Pulse and respiratory rates returned to normal post transfusion in 26.1 and 21.8% of the recipients respectively. In 10% of the transfusions there were minor adverse events; chills/fever (5.1%), itching (3.4%), hypothermia (1.0%) and vomiting (0.5%).

This in contrast with **Patel et al.(2021)** study, which showed the median pretransfusion Hb level was 11.2 g/dl which is greater than supported by the best-available evidence and may be explained to

give opportunity for improved patient blood management .

Our results showed that there is statistically significant positive correlation between the higher number of blood transfusion and the greater increase in HB level after transfusion. While there was statistically significant negative correlation between the HB level before transfusion and the increase in HB level after transfusion.

Also, the currently accepted mean target is 12 g/dl with a post-transfusion haemoglobin of 14-15 g/dl and a pre-transfusion haemoglobin of 9.0-10.5 g/dl. This overall approach to transfusion has been shown to promote normal growth.

The mean (SD) admitting hemoglobin level was 11.3 (2.3) g/dL, with 63% (2078/3295) of patients having an admitting hemoglobin level less than 12 g/dL and 29% (963/3295) less than 10 g/dL. Admitting hemoglobin was correlated with age ( $r = -0.11$ ;  $P < .001$ ) (VINCENT et al., 2002).

### Conclusion

We concluded that The most frequent indication of blood transfusion in studied cases was thalassemia in 40.0% followed by 6pdp in 25.0%, autoimmune hemolytic anemia acute hemorrhage and receiving

oxygen treatment in 10.0% for each cases h, and lastly severe decompensated anemia in 5.0%.

Among studied cases 11.7% developed complications during blood transfusion. The most frequent complications of blood transfusion in studied population was allergic reactions in 11.7% in the form of (flushing in 5% & rash in 3.3%) followed by febrile non-haemolytic transfusion reaction in 1.7% that was associated with rigor in 1.7% of cases

### Recommendations

- 1) keeping record of data about blood transfusion to monitor the need and its availability, side effects, frequency regarding type of patients
- 2) making annual record by the blood bank to the pediatric and other department
- 3) construction of a standardized form for requesting blood transfusion

### Limitation of the study

One of our research limitation was difficulty in satisfaction of parents to participant because data collection and sampling methods became stop if they didn't participated.

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