
بسم اللّه الرّحمن الرّحيم

Blood Transfusion in Thalassemia Syndrome

Dr Bijan Keikhaei

Haemovigilance

"Haemovigilance is the set of surveillance procedures covering the entire blood transfusion chain, from the donation and processing of blood and its components,through to their provision and transfusion to patients, and including their follow-up"

Blood Transfusion in Thalassemia Minor

Infection

Surgery

Pregnancy

Aging

CBC Profile in 1st Trimester

Age:19 yr **Sex: Female**

RBC:4.9 **Hb:9.7** **HCT:28.3**

MCV:59.2

MCH:20.6 **MCHC:34**

RDW:15.1 **PLT:339000** **Ferritin:65**

HbA: 92.4 **HbF: 2.2** **HbA2: 5.4**

Diagnosis: **Beta-Thal Minor**

CBC Profile in 3st Trimester

Age:19 yr Sex: Female

RBC:3.7 Hb:6.8 HCT:24.5

MCV:55.2

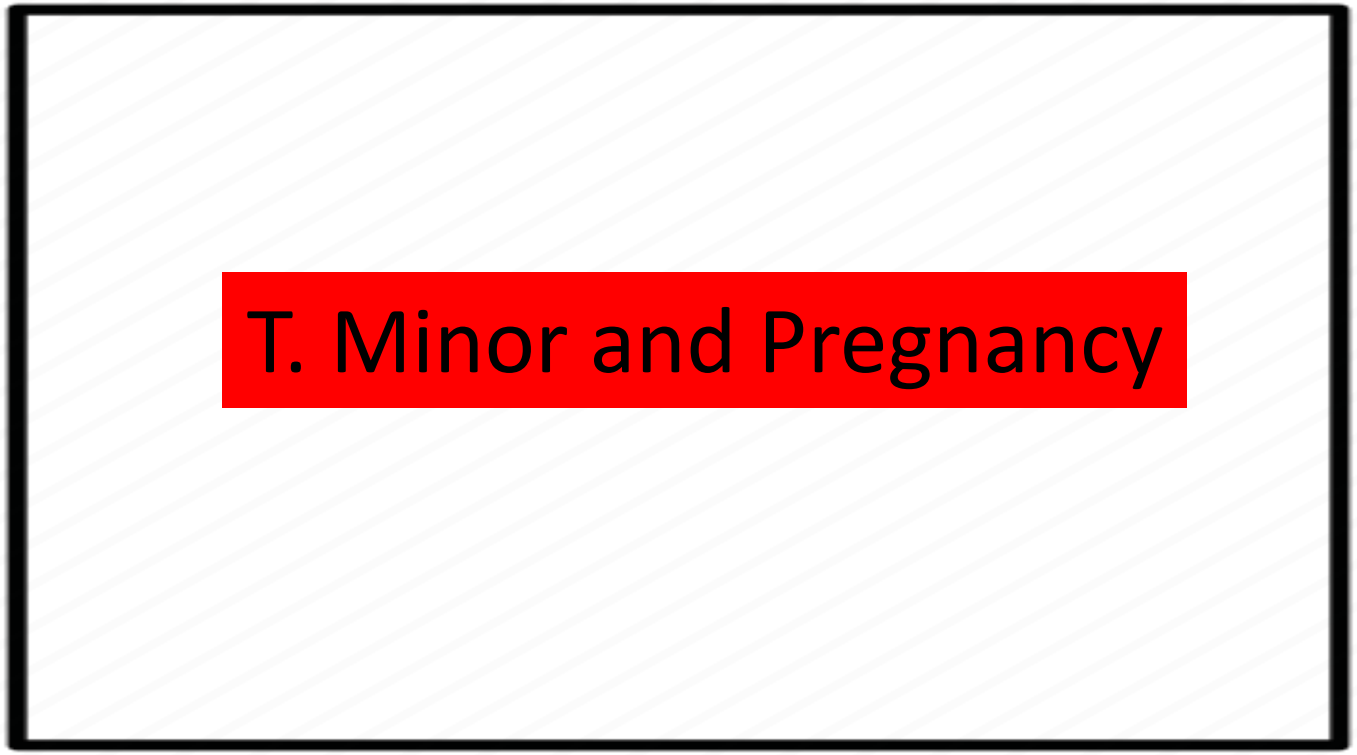
MCH:19.6 MCHC:30

RDW:25.1 PLT:256000 Ferritin:55

what is your Plan?

Pre Pregnancy Hb,

Present Hb,



In Which Trimester is Pregnancy

Clinical Condition,

Transfusions in TI are indicated where the following are observed:

* failure to thrive in childhood in the presence of significant anemia;
* emergence of bone deformities;
* increasing anemia not attributable to rectifiable factors;
* evidence of a clinically relevant tendency to thrombosis;
* presence of leg ulcers;
* development of pulmonary hypertension;
* delayed or poor pubertal growth spurt
* progressive splenic enlargement.

Thalassemia Intermediate

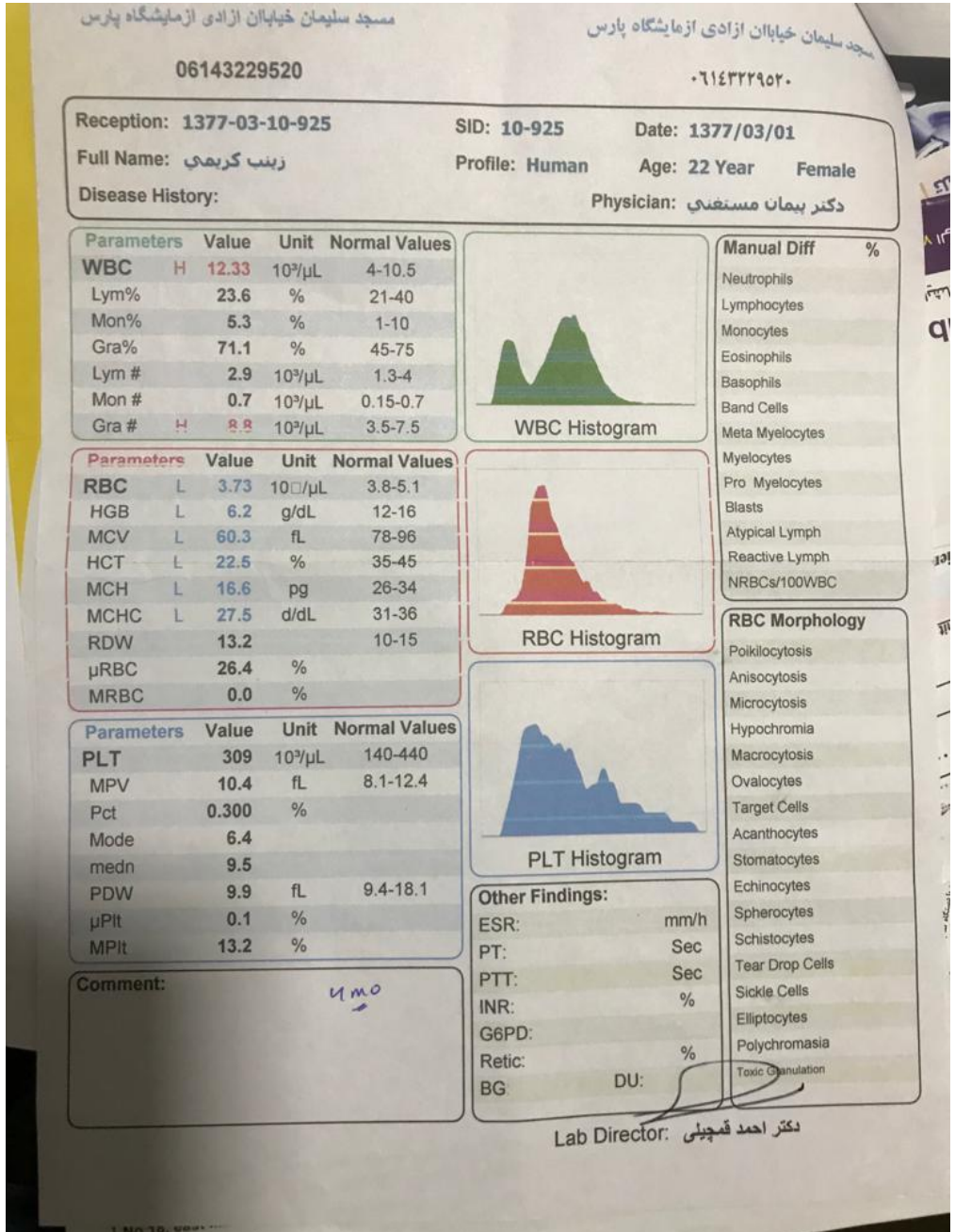
WBC:47.7 Age:47 yr Sex:F

RBC:3.7 Hb:8.2 HCT:24.5 MCV:60.2

MCH:18.6 MCHC:27.5

RDW:13.2 PLT:305000 Ferritin:65

500NRBC/100WBC



مسجد سلیمان خیابان ازادی ازمایشگاه پارس

06143229520

Reception: 1377-03-10-925 SID: 10-925 Date: 1377/03/01

Full Name: زینب کریمی Profile: Human Age: 22 Year Female

Disease History: Physician: دکتر پیمان مستغنی

Parameters		Value	Unit	Normal Values
WBC	H	12.33	10³/µL	4-10.5
Lym%		23.6	%	21-40
Mon%		5.3	%	1-10
Gra%		71.1	%	45-75
Lym #		2.9	10³/µL	1.3-4
Mon #		0.7	10³/µL	0.15-0.7
Gra #	H	8.8	10³/µL	3.5-7.5

WBC Histogram

Parameters		Value	Unit	Normal Values
RBC	L	3.73	10□/µL	3.8-5.1
HGB	L	6.2	g/dL	12-16
MCV	L	60.3	fL	78-96
HCT	L	22.5	%	35-45
MCH	L	16.6	pg	26-34
MCHC	L	27.5	d/dL	31-36
RDW		13.2		10-15
µRBC		26.4	%	
MRBC		0.0	%	

RBC Histogram

Parameters	Value	Unit	Normal Values
PLT	309	10³/µL	140-440
MPV	10.4	fL	8.1-12.4
Pct	0.300	%	
Mode	6.4		
medn	9.5		
PDW	9.9	fL	9.4-18.1
µPlt	0.1	%	
MPlt	13.2	%	

PLT Histogram

Manual Diff	%
Neutrophils	
Lymphocytes	
Monocytes	
Eosinophils	
Basophils	
Band Cells	
Meta Myelocytes	
Myelocytes	
Pro Myelocytes	
Blasts	
Atypical Lymph	
Reactive Lymph	
NRBCs/100WBC	

RBC Morphology
Poikilocytosis
Anisocytosis
Microcytosis
Hypochromia
Macrocytosis
Ovalocytes
Target Cells
Acanthocytes
Stomatocytes
Echinocytes
Spherocytes
Schistocytes
Tear Drop Cells
Sickle Cells
Elliptocytes
Polychromasia
Toxic Granulation

Comment: ymo

Other Findings:

ESR:	mm/h
PT:	Sec
PTT:	Sec
INR:	%
G6PD:	
Retic:	%
BG	DU:

Lab Director: دکتر احمد قمچیلی

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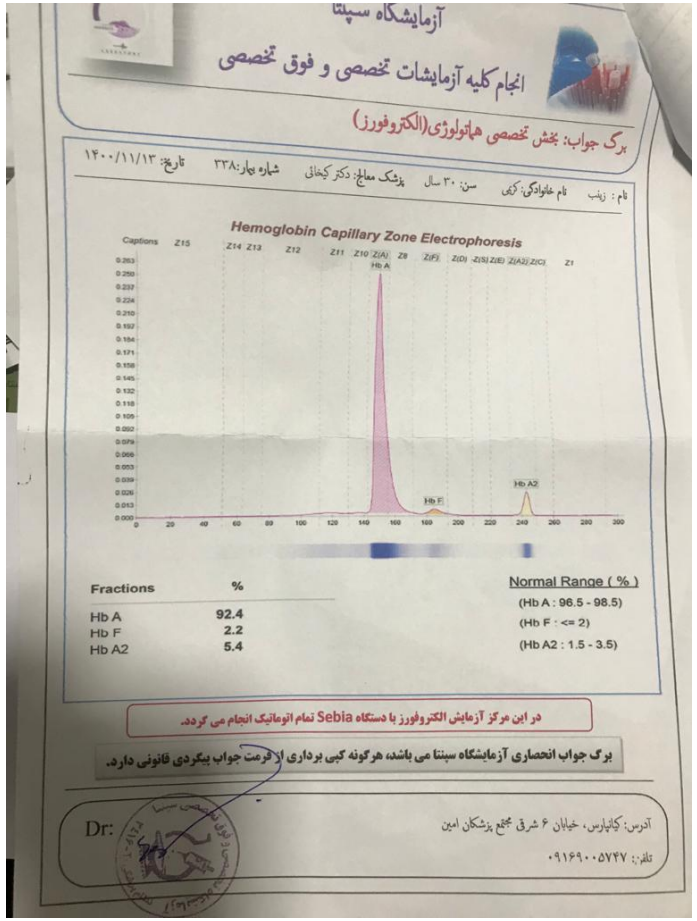


آزمایشگاه سپنا

انجام کلیه آزمایشات تخصصی و فوق تخصصی

برگ جواب: بخش تخصصی هماتولوژی(الکتروفورز)

نام : زینب نام خانوادگی: کیهی سن: ۳۰ سال پزشک معالج: دکتر کیخائی شماره بیمار:۳۳۸ تاریخ: ۱۴۰۰/۱۱/۱۳

Hemoglobin Capillary Zone Electrophoresis

Fractions	%
Hb A	92.4
Hb F	2.2
Hb A2	5.4

Normal Range (%)
(Hb A : 96.5 - 98.5)
(Hb F : <= 2)
(Hb A2 : 1.5 - 3.5)

در این مرکز آزمایش الکتروفورز با دستگاه Sebia تمام اتوماتیک انجام می گردد.

برگ جواب انحصاری آزمایشگاه سپنا می باشد، هرگونه کپی برداری از فرمت جواب پیگردی قانونی دارد.

Dr:

آدرس: کیانپارس، خیابان ۶ شرقی مجتمع پزشکان امین

تلفن: ۰۹۱۶۹۰۰۵۷۴۷

HbA: 92.4 HbF: 2.2 HbA2: 5.4

CD۳۶-37+Triple alpha

تاریخ:
شماره:
پیوست:

آزمایشگاه ژنتیک پزشکی و تشخیص پیش از تولد
Medical Genetic & PNDLab

Molecular Analysis Report forα/β-Thalassemia

Subject Identification	Sample Information
Patient Names: Zeinab Karimi	Sample ID: 20995
Origin: Bakhtiari	File number: 10038
Referring Physician:	Date of Collection: 18.4.93
Type of Sample: Whole Blood	Date of Report: 20.5.93

Hematological Indices

	HGB	HbA2 (%)	HbF (%)	Other Hb (%)	MCH (pg)	MCV (fL)	RBC (10^6/μL)
Female:							
Male							

Mutation Analysis for β-globin by	ARMS PCR ☐	DNA Sequencing ■	RFLP ☐	Strip ☐	
Mutation Analysis for α-globin by	GAP-PCR ■	DNA Sequencing ☐		Strip ☐	

Results

DNA analysis for alpha and beta-globin gene mutations reveals that the female has CD36-37(-T) mutation in heterozygous form on beta globin gene and she is carrier for alpha globin gene mutation with $\alpha\alpha\alpha^{Anti3.7}/\alpha\alpha$ genotype. Therefore, the female is affected by thalassemia intermediate.

در بررسي جهش‌هاي ژن هاي آلفا و بتا گلوبين مشخص گرديد كه خانم داراي موتاسيون CD36-37(-T) در شرايط هتروزيگوت در ژن بتا گلوبين بوده، ناقل موتاسيون آلفا گلوبين با ژنوتيپ $\alpha\alpha\alpha^{Anti3.7}/\alpha\alpha$ مي باشد. بنابراين، خانم مبتلا به تالاسمي اينترمديا مي باشد.

Note: It is of outmost importance for all clinicians involved in the care of families requesting prenatal diagnosis, and the families themselves to be aware of the **risk of errors** in DNA analysis. Incorrect diagnosis may result from (1) Incorrect hematological data and clinical diagnosis for thalassemia (2) Incomplete family studies and history (3) Mix-up of DNA or blood samples both in transportation or in the lab (4) Paternity problems, adoptions, IVF (5) Maternal contamination of CVS (6) Rare molecular events (7) New or spontaneous mutations (8) Technical errors. The risk of error from DNA recombination in diagnosis by polymorphism is approximately 0.3%. The risk of error from the various reasons mentioned above and several other factors is approximately 0.5% whereas the chances of technical error of all types of DNA analysis are estimated to be 0.5%.The methods applied for diagnosis of this disease were in accordance with national guidelines and latest technologies available to be utilized in this lab.

Shariati GH
MD, PhD in Molecular Medical Genetics
Laboratory Director

دکتر غلامرضا شریعتی
دکترای تخصصی ژنتیک پزشکی
نظام پزشکی ۲۸۸۸
نظام آزمایشگاهی ۲۵۸۷

Age at First Transfusion	Alloimmunisation Rate	
< 1 year old	7.7%	
> 1 year old	27.9%	[Machail-Merianou et al, 1987]

Age at First Transfusion	Alloimmunisation Rate	
< 3 years old	20.9%	
> 3 years old	47.5%	[Spanos et al, 1990]

Alloimunisation

Development of one or more specific red cell antibodies (alloimmunisation) is a common complication of chronic transfusion therapy

Important to monitor patients carefully for the development of new antibodies

Eliminate donors with the corresponding antigens.

Anti-E, anti-C and anti-Kell alloantibodies are most common.

5-10% of patients present with alloantibodies against rare erythrocyte antigens or with warm or cold antibodies of unidentified specificity.

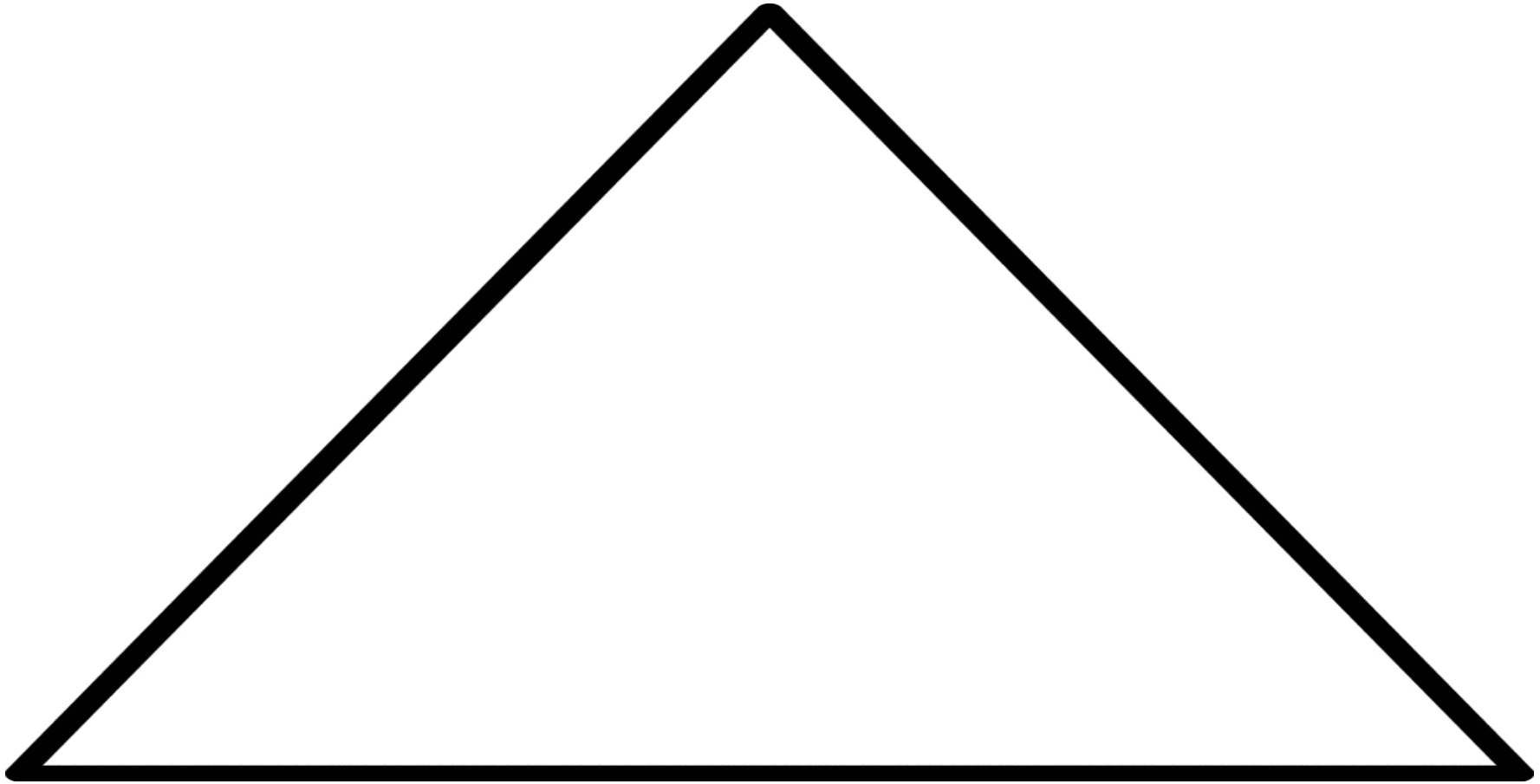
Criteria for initiating transfusion therapy

Confirmed diagnosis of thalassemia.
Laboratory criteria:

- Haemoglobin level <7 g/dl on 2 occasions, > 2 weeks apart (excluding all other contributory causes such as infections) AND/OR
Clinical criteria irrespective of hemoglobin level:
> Significant symptoms of anemia
> Poor growth / failure to thrive
> Complications from excessive intramedullary hematopoiesis such as pathological fractures and facial changes
> Clinically significant extramedullary haematopoiesis

The primary goal of transfusion in TMajor,

Suppression of IE



correction of anemia

Reduced absorption of iron from the GI.

Aims of blood transfusion in T Major

- The aim of blood transfusion in thalassemia is to deliver a **safe and effective transfusion** regimen whilst minimising the burden of transfusion therapy on everyday life.
- An effective transfusion regimen will result in:
  - Good growth and development
  - Good energy levels
  - Sufficient suppression of intra and extramedullary hematopoiesis

Transfusion in T Major

Before starting a transfusion programme the child must have an extended erythrocyte antigen typing (**at least ABO, Rh (D, C, c, E, e) and Kell**, but preferably an even more detailed phenotype) in order to minimize the risk of alloimmunization

Optimal Goal of Transfusion in T Major

The optimal goal for most patients is a **pre-transfusion hemoglobin** concentration of **9–10.5 g/dL**

Some recommendations state a mean hemoglobin concentration of approximately **11.5 g/dL (WHO).**

Standard Transfusion Regimen for Thalassaemia Major

Regular blood transfusions administered every 2-5 weeks

Maintain the pre-transfusion Hb > 9-10.5g/dl

Rationale

promotes normal growth

allows normal physical activities

adequately suppresses bone marrow activity in most patients

minimises transfusional iron accumulation [Cazzola 1995,1997]

Modifications

A higher target 11-12 g/dl may be appropriate for patients with *heart disease* or other medical conditions and for those patients who do not achieve adequate *suppression of bone marrow activity* at the lower haemoglobin level.

Although shorter intervals between transfusions may reduce overall blood requirements, the choice of interval must take into account other factors such as the patient's work or school schedule

Relationship between transfusion regimen and suppression of erythropoiesis

52 patients with thalassaemia major whose mean pre-transfusion haemoglobin levels ranged from 8.6 to 10*9g/dl

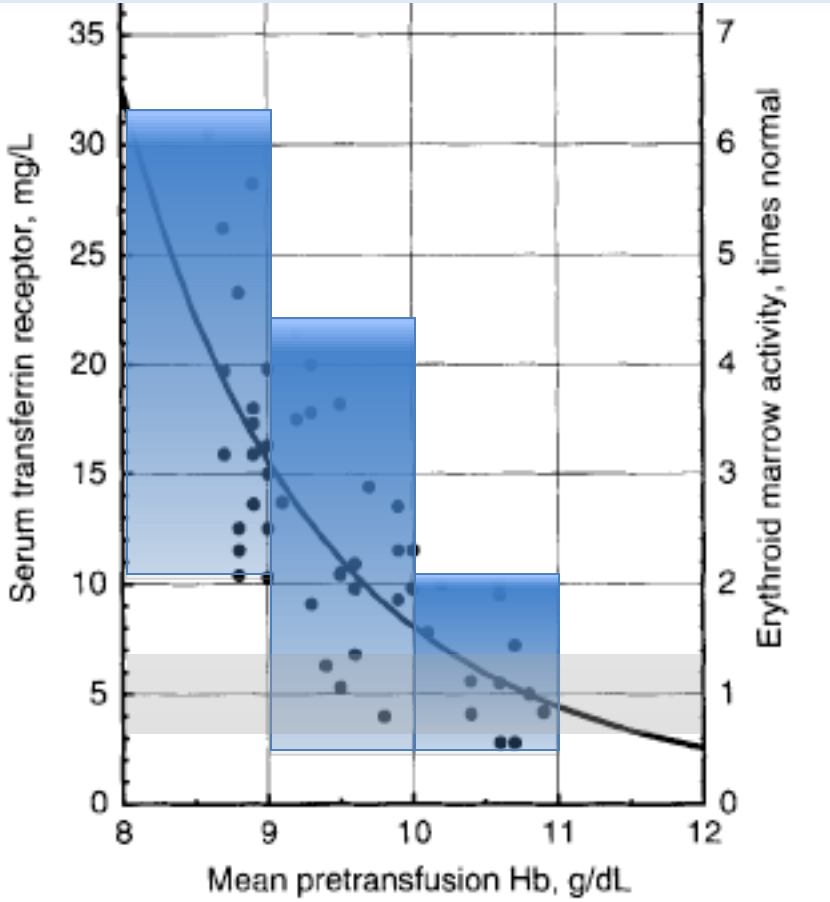
Multiple regression analysis showed that serum transferrin receptor was the parameter more closely related to mean pretransfusion haemoglobin (r = -0.77, *P < 0.001)*

Pretransfusion Hb 10-11g/dl- 1-2x normal

Pretransfusion Hb 9-10 g/dl- 1-4x normal

Pretransfusion Hb 9.6-9 g/dl- 2-6 x norma

{Cazzola, 1995 #906}



Guidelines for choosing how much blood to transfuse

Target Increase in Haemoglobin Level	Haematocrit of Donor Red Cells			
	50%	60%	75%	80%
1 g/dl	4.2 ml/kg	3.5 ml/kg	2.8 ml/kg	2.6 ml/kg
2 g/dl	8.4 ml/kg	7.0 ml/kg	5.6 ml/kg	5.2 ml/kg
3 g/dl	12.6 ml/kg	10.5 ml/kg	8.4 ml/kg	7.8 ml/kg
4 g/dl	16.8 ml/kg	14.0 ml/kg	11.2 ml/kg	10.4 ml/kg

As an example, to raise the haemoglobin level by 4 g/dl in a patient weighing 40 kg and receiving AS-1 blood with a haematocrit of 60% would require 560 ml. This calculation assumes a blood volume of 70 ml/kg of body weight.

Thalassaemia International Federation Guidelines

Packed RBC: Desired Hb - Patient Hb*3.5*patient weight

The post-transfusion Hb should not be greater than
14-15g/dl

If the annual consumption exceeds more than 200–220 ml kg of packed erythrocytes, one should consider the development of alloantibodies or splenectomy.

Adverse reactions

Acute hemolytic reactions

Delayed transfusion reactions

Autoimmune hemolytic anemia

Non-hemolytic febrile transfusion reactions

Allergic reactions

Transfusion-related acute lung injury (TRALI)

Graft versus host disease (GVHD)

Blood products for special patient populations

Washed red cells

may be beneficial for repeated severe allergic transfusion reactions.

Saline washing removes plasma proteins in the donor product that are the target for antibodies in the recipient.

Other clinical states that may require washed red cell products include *IgA deficiency*, in which the recipient's preformed antibody to IgA may result in an anaphylactic reaction.

Washing usually does not result in adequate leucocyte reduction and therefore should be used in conjunction with filtration.

Frozen red cells

used to maintain a supply of rare donor units for certain patients who have unusual red cell antibodies of who are missing common red cell antigens.

The Council of Europe is promoting an international network of rare blood donor units

Neocyte or young red cell transfusion

may modestly reduce blood requirements. However, patients are exposed to a higher number of donors

پایان

با تشکـــر