

TABLE I NOVEL COMPLETE BLOOD COUNT PARAMETERS WITH THEIR REFERENCE RANGE AND CLINICAL UTILITY

Parameter	Reference values/range for pediatric age group	Where to use	Remarks
<i>RBC Parameters</i>			
Nucleated RBC (NRBC)	3-7% (till day 4 of life for term infant); <21% (till day 10 of life for pre-term infant); <1% beyond the above time period	<ul style="list-style-type: none"> Acute hemolytic episodes Severe hypoxic states To assess severity of thalassemia/hemoglobinopathies and determine transfusion requirement To suspect bone marrow infiltrative disorder Prognostic marker in ICU/transplant patients 	Indicates increased erythroid turnover
Fragmented red cells (FRC %)	1.4-1.9% (term infant); 4.9-5.5% (preterm infant); <1% (beyond infancy)	<ul style="list-style-type: none"> Diagnosis of thrombotic microangiopathy in DIC (perinatal asphyxia, infection, sepsis) Neonatal hemolytic uremic syndrome Congenital ADAMTS13 deficiency; Homozygous protein C deficiency; Giant hemangioma 	<ul style="list-style-type: none"> Good negative predictive value but low specificity (get a smear reviewed if FRCs are more) Case with high MCV may show false negative results
Immature reticulocyte fraction (IRF %)	9.0-24.0 (6 months – 5yr); 7.5-23.4 (6-11yr); 6.5-26.7 (12-17 yr, F); 6.9-23.0 (12-17, M)	<ul style="list-style-type: none"> To distinguish various types of anemias Monitoring recovery following bone marrow transplant Early diagnoses of chemotherapy-induced bone marrow aplasia To assess response to iron or Vitamin-B12/folate supplementation To assess response to ESAs 	Indicator of degree of effective erythropoiesis
Mean content of hemoglobin within the reticulocytes (CHr –pg)	For CHr-27.5-33.4 (6 months–5yr); 28.3-33.1 (6-11yr); 29.1-34.5 (12-17 yr, F); 28.8-35.2 (12-17 yr, M)	<ul style="list-style-type: none"> Diagnosis of anemia of renal failure, anemia of chronic disease and iron deficiency anemia (Ret-He <25pg in IDA*) To assess early response to iron supplementation (Ret-He <30.6pg*) or for monitoring EPO therapy (CHr value <29 pg and Ret-He value <25pg predicts FID in patients receiving EPO therapy*) 	<ul style="list-style-type: none"> Provide the status of functional iron available for the erythropoiesis during the last 3-4 days Also reduced in hemoglobinopathies Increased in macrocytosis
Mean reticulocyte volume (MRV-fl)	MRV-LH 750- 93-117.8 fl*MCVr-Advia 120- 98-115 fl*Cell Dyn Sapphire- 92-116 fl*	<ul style="list-style-type: none"> Similar clinical utility as of mean content of hemoglobin within the reticulocytes To monitor the response to iron or vitamin-B12/folate therapy Screening cases of hereditary spherocytosis 	Reference intervals should be determined according to the use of specific methods or analyzers
Percentage hypochromic cells (% HRC)	0.1-3.7 (6 months -5 yr); 0.1-2.9 (6-11 yr) 0.2-2.1 (12-17 yr, F) 0.1-2.2 (12-17 yr, M)	<ul style="list-style-type: none"> Assessment of iron restricted erythropoiesis (during last three months) 	<ul style="list-style-type: none"> Limited value if there is coexistent a-thalassemia

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Mean sphered cell volume (MSCV)	Not available	<ul style="list-style-type: none"> Used in conjunction with other parameters for screening of hereditary spherocytosis. 	MCV-MSCV >10 and MRV-MSCV <25 have good sensitivity and specificity
<i>WBC Parameters</i>			
WBCs volume, conductivity and scatter (VCS)	Not available	<ul style="list-style-type: none"> Alters as per the diagnosis of diseases which causes changes in WBC populations 	Various regression equations/ algorithms proposed for specific conditions
Immature granulocytes (IGs)	Not applicable	<ul style="list-style-type: none"> Present in systemic inflammation and sepsis, hematological disorder like myeloproliferative neoplasm or acute myeloid leukemia, or a bone marrow infiltrative disorder 	Includes promyelocytes, myelocytes and metamyelocytes. <ul style="list-style-type: none"> Indicative of viral infection, lymphoma or leukemia.
Atypical lymphocytes	Not applicable	<ul style="list-style-type: none"> Monitoring of sepsis because of viral infections 	Warrants a smear review.
Neutrophil granulation	Not available	<ul style="list-style-type: none"> Increased value in sepsis and low in cases of MDS or MDS/MPN (CMML) 	NEUT-X lower than 1,315 and NEUT-Y lower than 400 may indicate MDS*.
<i>Platelet Parameters</i>			
Mean platelet volume (MPV)	7-12 fL*	<ul style="list-style-type: none"> To assess bleeding disorders and thrombocytopenia 	-
Immature platelet fraction(IPF)	1-5%*	<ul style="list-style-type: none"> Increased in ITP/TTP and low to normal in bone marrow failure. 	-

*Indicates cut-off values/reference range for adult patients; ICU: Intensive care unit; DIC: Disseminated intravascular coagulation; ADAMTS13: A disintegrin and metalloproteinase with thrombospondin like domain 13; MCV: Mean corpuscular volume; ESAs: Erythropoiesis stimulating agents; EPO: Erythropoietin; FID: Functional iron deficiency; MDS: Myelodysplastic syndrome; MDS/MPN: Myelodysplastic syndrome/Myeloproliferative neoplasm overlap; ITP: Immune thrombocytopenic purpura; TTP: Thrombotic thrombocytopenic purpura.