

The FBC: What does it show?

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The FBC: What does it show?

Full Blood Count (FBC)

WBC.....	8.17	x10 ⁹ /L	4.00 – 10.50
Platelets.....	175	x10 ⁹ /L	145 – 400
[REDACTED]			
Neut.....	4.15	x10 ⁹ /L	1.80 – 7.50
Lymph.....	3.23	x10 ⁹ /L	1.30 – 4.00
Mono.....	0.59	x10 ⁹ /L	0.20 – 0.80
Eosin.....	0.16	x10 ⁹ /L	0.02 – 0.40
Baso.....	0.04	x10 ⁹ /L	0.00 – 0.20
ESR.....	5	mm/h	1 – 12
RDW.....	13.8		11.5 – 14.5
Nucleated RBC's.....	0.0	%	

(Normal for an adult female)

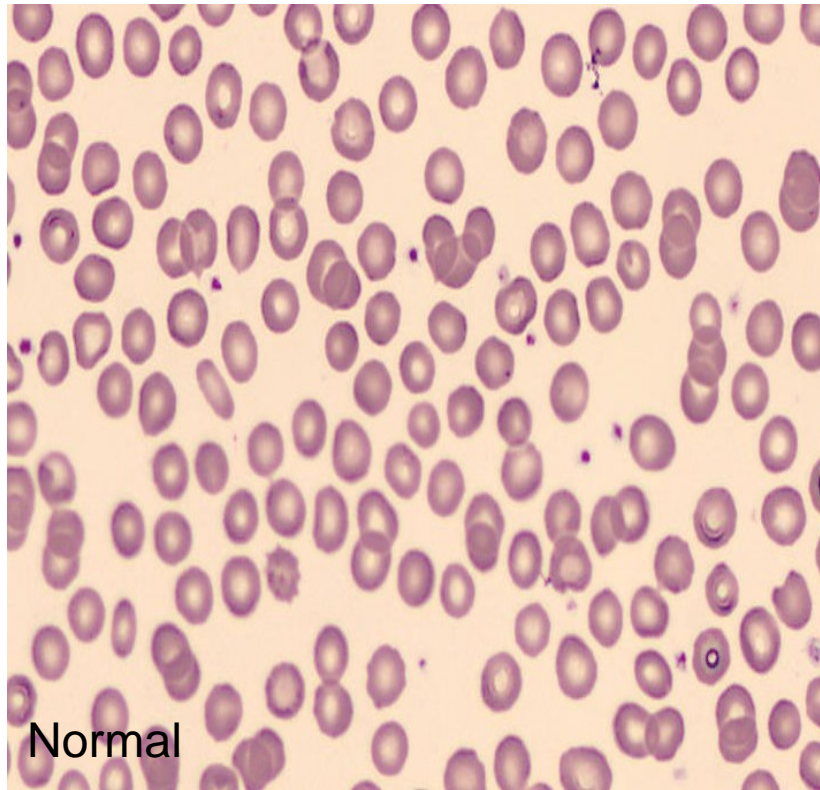
Anaemia

- Anaemia is a reduced haemoglobin (Hb) concentration in the blood.
- Normal range for Hb in adults:
 - Females – 11.5 – 16 g/dL
 - Males – 12.5 – 18 g/dL
- Anaemia is classified using the red cell indices.
- Different causes of anaemia can be determined using these classifications and looking at the clinical picture.

Red Cell Indices

- Some of the parameters are measured using automated cell counters and the others are then calculated.
- Mean Cell Volume (MCV) gives the average size of the red cells.
- Haematocrit (HCT) gives the proportion of red cells in a sample. ($HCT = MCV \times RBC$).
- Red Blood Cells (RBC) gives the number of red cells.
- Mean Cell Haemoglobin (MCH) gives the average amount of Hb in each red cell. ($MCH = Hb \div RBC$).
- Mean Cell Haemoglobin Concentration (MCHC) gives the average concentration of Hb in each red cell. ($MCHC = Hb \div HCT$).

Normal Ranges in Adults

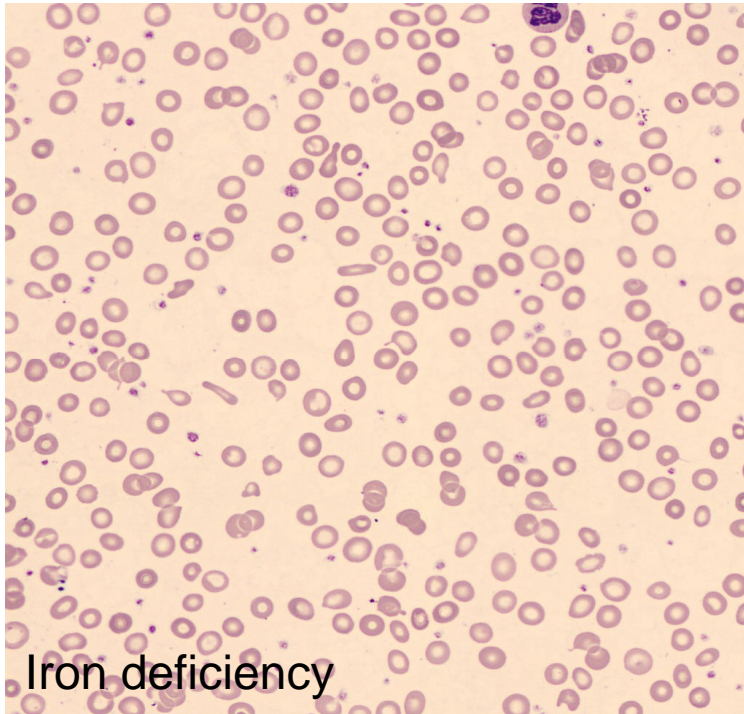


- MCV - 80 – 101 fL
- MCH - 25 – 31 pg
- MCHC - 31 – 36 g/dL

Classification of anaemia

- Using the red cell indices the likely cause of anaemia can be determined but to help with this further tests can be done.
- Usually a blood film will be examined and used along with the clinical details to support a diagnosis.
- Different features in the blood film can help to identify the cause of an anaemia.
- Results from other tests, for example ferritin, B12/folate levels, LDH and Direct Antiglobulin Test, can also help the diagnosis.

Microcytic, hypochromic anaemia



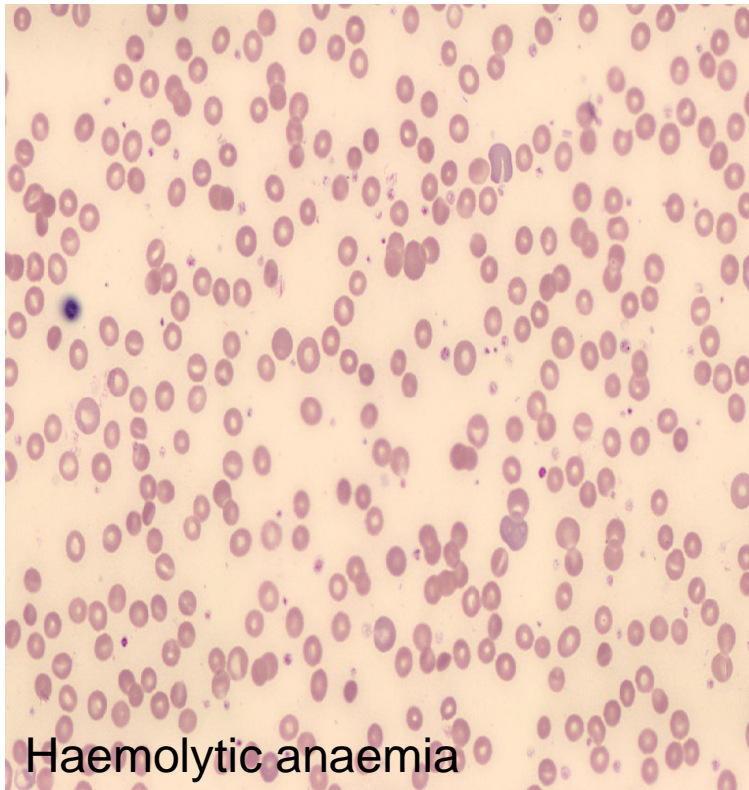
Iron deficiency

- MCV <80 fL
- MCHC <31 g/dL
- These indices show that the red cells are smaller than normal and have a lower Hb concentration per cell than usual.
- The main causes are iron deficiency and thalassaemia and sometimes anaemia of chronic disease.

Microcytic, hypochromic anaemia

- Iron deficiency
 - Pencil cells
 - Raised platelet count
- Thalassaemia
 - Target cells
 - Occasionally basophilic stippling

Normocytic, normochromic anaemia



- MCV and MCHC are within normal ranges.
- The red cells are of normal size and have normal Hb concentration or they can be of varying sizes but average is “normal”.
- Anaemia is due to a fewer number of red cells.
- Causes of this can be blood loss, haemolytic anaemia, secondary anaemia and mixed deficiency anaemia.

Normocytic, normochromic anaemia

- Blood loss
 - Clinical details
- Haemolytic anaemia
 - Fragments, spherocytes, polychromasia and NRBCs.
- Secondary anaemia
 - Marrow or renal failure

Macrocytic anaemia



- MCV >101 fL
- MCHC within normal range
- The red cells are larger than usual but have a normal Hb concentration.
- Causes of this can be B12/folate deficiency, liver disease, hypothyroidism, cytotoxic drugs and myeloma.
- This can also be due to a reticulocytosis.

Macrocytic anaemia

- B12/folate deficiency
 - Oval macrocytes
 - Hypersegmented neutrophils
- Liver disease
 - Round macrocytes
 - Absence of hypersegmented neutrophils

Summary

Normocytic, normochromic	Microcytic, hypochromic	Macrocytic, normochromic
Bleeding	Iron deficiency	B12 / folate deficiency
Haemolysis (inc drug- induced)	Thalassaemia	Anaemia due to alcoholism / liver disease
Anaemia of chronic disease		Some drug-induced anaemias
Most structural variants of Hb	Some structural variants of Hb	Diamond-Blackfan

The FBC: What does it show?

Hb.....	11.9	L	g/dL	12.5 - 18.0
WBC.....	8.08		$\times 10^9/L$	4.00 - 10.50
Platelets.....	174		$\times 10^9/L$	145 - 400
MCV.....	94.7		fL	80.0 - 101.0
HCT.....	0.359	L		0.41 - 0.51
RBC.....	3.79	L	$\times 10^{12}/L$	4.50 - 5.90
MCH.....	31.4		pg	25.0 - 35.0
MCHC.....	33.1		g/dL	31.0 - 36.0
Neut.....	6.47		$\times 10^9/L$	1.80 - 7.50
Lymph.....	0.68	L	$\times 10^9/L$	1.30 - 4.00
Mono.....	0.73		$\times 10^9/L$	0.20 - 0.80
Eosin.....	0.16		$\times 10^9/L$	0.02 - 0.40
Baso.....	0.04		$\times 10^9/L$	0.00 - 0.20
RDW.....	16.1	H		11.5 - 14.5
Nucleated RBC's.....	0.2		%	

72 year old male. Haemodialysis unit.

The FBC: What does it show?

Hb.....	8.8	L	g/dL	11.5 - 16.0
WBC.....	10.30		$\times 10^9/L$	4.00 - 10.50
Platelets.....	405	H	$\times 10^9/L$	145 - 400
MCV.....	76.1	L	fL	80.0 - 101.0
HCT.....	0.281	L		0.36 - 0.46
RBC.....	3.69	L	$\times 10^{12}/L$	4.00 - 5.20
MCH.....	23.8	L	pg	25.0 - 35.0
MCHC.....	31.3		g/dL	31.0 - 36.0
Neut.....	8.16	H	$\times 10^9/L$	1.80 - 7.50
Lymph.....	1.03	L	$\times 10^9/L$	1.30 - 4.00
Mono.....	1.03	H	$\times 10^9/L$	0.20 - 0.80
Eosin.....	0.05		$\times 10^9/L$	0.02 - 0.40
Baso.....	0.03		$\times 10^9/L$	0.00 - 0.20
RDW.....	16.6	H		11.5 - 14.5
Nucleated RBC's.....	0.0		%	

67 year old female. A&E with SOB and epistaxis.

The FBC: What does it show?

Hb.....	9.1	L	g/dL	11.5 - 16.0
WBC.....	8.02		x10 ⁹ /L	4.00 - 10.50
Platelets.....	354		x10 ⁹ /L	145 - 400
MCV.....	113.1	H	fL	80.0 - 101.0
HCT.....	0.257	L		0.36 - 0.46
RBC.....	2.27	L	x10 ¹² /L	4.00 - 5.20
MCH.....	40.0	H	pg	25.0 - 35.0
MCHC.....	35.4		g/dL	31.0 - 36.0
Neut.....	5.20		x10 ⁹ /L	1.80 - 7.50
Lymph.....	1.42		x10 ⁹ /L	1.30 - 4.00
Mono.....	1.27	H	x10 ⁹ /L	0.20 - 0.80
Eosin.....	0.04		x10 ⁹ /L	0.02 - 0.40
Baso.....	0.09		x10 ⁹ /L	0.00 - 0.20
RDW.....	15.3	H		11.5 - 14.5
Nucleated RBC's.....	0.0		‰	

53 year old female. GP request – No clinical details.

Thank you for listening

Any questions?