AMPATH LAB UPDATE

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Laboratory monitoring of patients with COVID-19

The laboratory plays a crucial role in the diagnosis of COVID-19 through the use of real-time reverse transcription polymerase chain reaction (rRT-PCR) for the detection of unique sequences of viral RNA. Subsequently, it also provides critical haematological and biochemical tests for assessing disease severity and progression, as well as for monitoring therapeutic intervention.

The most important tests and their clinical relevance are shown in Table 1. It is advised that these tests are performed on hospital admission in patients with suspected severe disease, as well as in patients with comorbidities

Table 1: Laboratory tests for patients with COVID-19

Laboratory test	Expected abnormalities	Potential clinical significance	Odds-ratio (95% CI) of in-hospital death
Full blood count (FBC)	Increased WBC count (rare) Increased neutrophil count Decreased lymphocyte count Mostly normal platelet count, decreased platelet count should be further investigated	May indicate bacterial (super)infection T-cell destruction, acute inflammatory response Inflammation	6.60 (3.02–14.41) If WBC >10 x 10^9/l
D-dimer	Increased	Activation of blood coagulation with fibrinolysis	20.04 (6.52–61.56) if D-dimer >1 mg/l
Prothrombin time (PT)	Increased	Activation of blood coagulation	4.62 (1.29–16.50) if PT ≥16 seconds
Blood gas (arterial)	Decreased pO_2 and saturation Hypercarbia Acidosis	Important in critical care management	
CRP	Increased	Severe viral infection/viraemia/viral sepsis	
Procalcitonin (PCT)	Increased	Bacterial (super)infection	13.75 (1.81–104.40) if PCT ≥ 0.5 ng/ml
Ferritin	Increased	Severe inflammation Secondary thrombotic micro-angiopathy Secondary haemophagocytic lymphohistiocytois (sHLH)	9.10 (2.04–40.58) if ferritin >300 ng/ml
Urea	Increased	Kidney injury	
Creatinine	Increased	Kidney injury	4.39 (1.01–19.06) if creatinine >133 umol/l
Glucose	Variable	Uncontrolled hyperglycaemia worsens prognosis in diabetics/non-diabetics	
Albumin	Decreased	Impaired liver function	
Total bilirubin	Increased	Liver injury	
ALT	Increased	Liver injury and/or organ damage	

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Laboratory test	Expected abnormalities	Potential clinical significance	Odds-ratio (95% CI) of in-hospital death
AST	Increased	Liver injury and/or organ damage	
LDH	Increased	Liver and/or pulmonary injury and/or widespread organ damage	
Creatine kinase (CK)	Increased	Muscle injury	
Cardiac hsTroponins (hsTn)	Increased	Cardiac injury	80.07 (10.34–620.36) if hsTn > 99th centile

Modified from IFCC Information guide on COVID-19
Univariate odds ratios from Zhou F et al., 2020; Lancet 395: 1054-62.

In addition to the conventional inflammatory markers, Interleukin-6 (IL-6) is recommended as a marker of the "cytokine storm syndrome", often seen in patients with severe COVID-19.

Several studies have demonstrated the utility of laboratory tests to predict disease severity and mortality in patients with COVID-19. These include a high neutrophil-to-lymphocyte ratio (>1.4), persistently decreased CD4 and CD8 counts, CD19+ B cells and NK cells (CD16+CD56+), increased D-dimer, creatinine, LDH levels (>245 U/l) (more common in COVID-19 compared to other causes of pneumonia), CK, ferritin, CRP, IL-6 and PCT, increased high sensitive cardiac troponins (hsTn), and uncontrolled hyperglycaemia (worsens prognosis in all patients, not only in diabetics).

According to Zhou et al. (2020), increasing age, elevated D-dimer levels (>1 mg/l) and a high Sequential Organ Failure Assessment (SOFA) score were found on multivariate regression analysis to be the strongest independent risk factors of in-hospital death, which could help clinicians identify at an early stage those patients with COVID-19 who have a poor prognosis.

More information on the use of inflammatory markers and hsTn in COVID-19 will follow soon.

Please note that the information provided is for guidance only and is based on the emerging literature at the time of writing.

As COVID-19 spreads and new information becomes available, the recommendations may change.

References

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