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rattibha.com

1/ Hello #medtwitter

This month's @ASPNePh Pathology webinar is on pediatric #COVID19 related #AKI.

#Medtweeetorial #nephtwitter #pedneph

#COVID19 #AKI #vaccinate

Let's talk numbers!

What is the estimated average incidence of AKI in critically ill children with COVID-19?

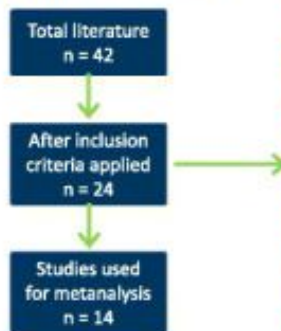
2/ C. 30-40% - definition, geographic differences, and illness severity lead to varying AKI incidences. Meta-analysis of 14 studies of ~1,000 PICU patients estimate ~30.51%. SPARC-1 study estimates point prevalence of ~40% in confirmed COVID-19 PICU patients

PMID: 34331019

# Critical Analysis of Acute Kidney Injury in Pediatric COVID-19 Patients in the Intensive Care Unit

**HYPOTHESIS:** AKI is a common negative outcome in pediatric COVID-19 patients admitted to the ICU.

## Study design: systematic review



	Event/Sample size	Proportion (%) (95% CI)	Random Weight (%)
Total incidence of AKI in pediatric COVID-19 patients	317/1,247	30.51 (21.84 - 39.94)	100
KRT incidence in pediatric COVID-19 patients with AKI	4/712	0.56 (0.16 - 1.43)	100
COVID-19 patients requiring respiratory support	503/1086	46.33 (24.99 - 68.40)	100
COVID-19 patients requiring inotropic support	103/191	53.96 (34.43 - 72.88)	100
Total mortality among pediatric COVID-19 patients	25/989	2.55 (1.67 - 3.73)	100
Incidence of MIS-C in pediatric COVID-19 patients	896/1206	74.29 (41.24 - 96.43)	100

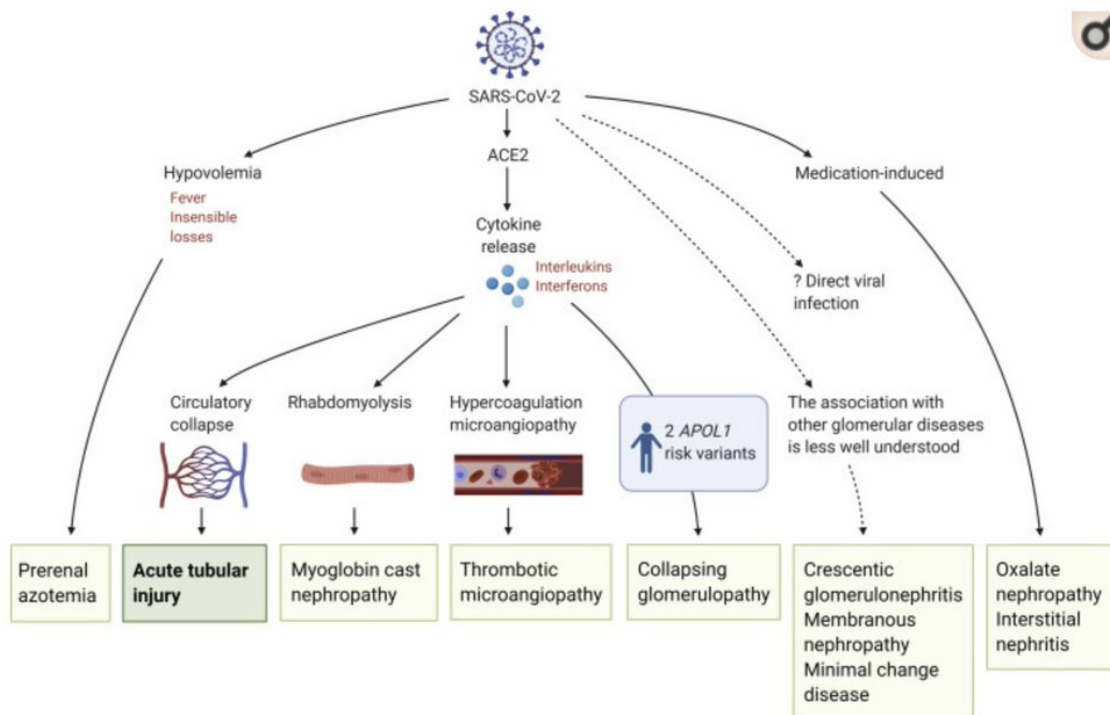
AKI, acute kidney injury; ICU, intensive care unit; KRT, kidney replacement therapy; MIS-C, inflammatory syndrome in children

**CONCLUSION:** AKI has shown to be a negative prognostic factor in the pediatric COVID-19 cohort admitted to the ICU with high incidence and mortality rates. Further studies are needed in this population to accurately define the epidemiology of AKI and identify associated risk factors.

Raina et al. 2021

3/ Why is AKI so common in COVID-19 patients?  
The pathogenesis is likely multifactorial:

- ✓ systemic consequences of viral infection
- ✓ initiation of the inflammatory cascade
- ✓ cross talk between the kidney and directly infected organs.



4/ Let's go ahead with another poll!

As there is limited pediatric pathology...

What is the most common ADULT pathology associated with COVID-19 AKI?

5/ C. Acute Tubular Injury (ATI) – Proximal tubular dysfunction was evident histologically in COVID-19 native kidney and autopsy samples and clinically by:

- ✓ LMW proteinuria
- ✓ aminoaciduria
- ✓ glycosuria
- ✓ phosphaturia
- ✓ hyperuricosuria

# 6/ What about COVID-19 collapsing glomerulopathy everyone is talking about?

Distinct pathology associated with SARS-COV2

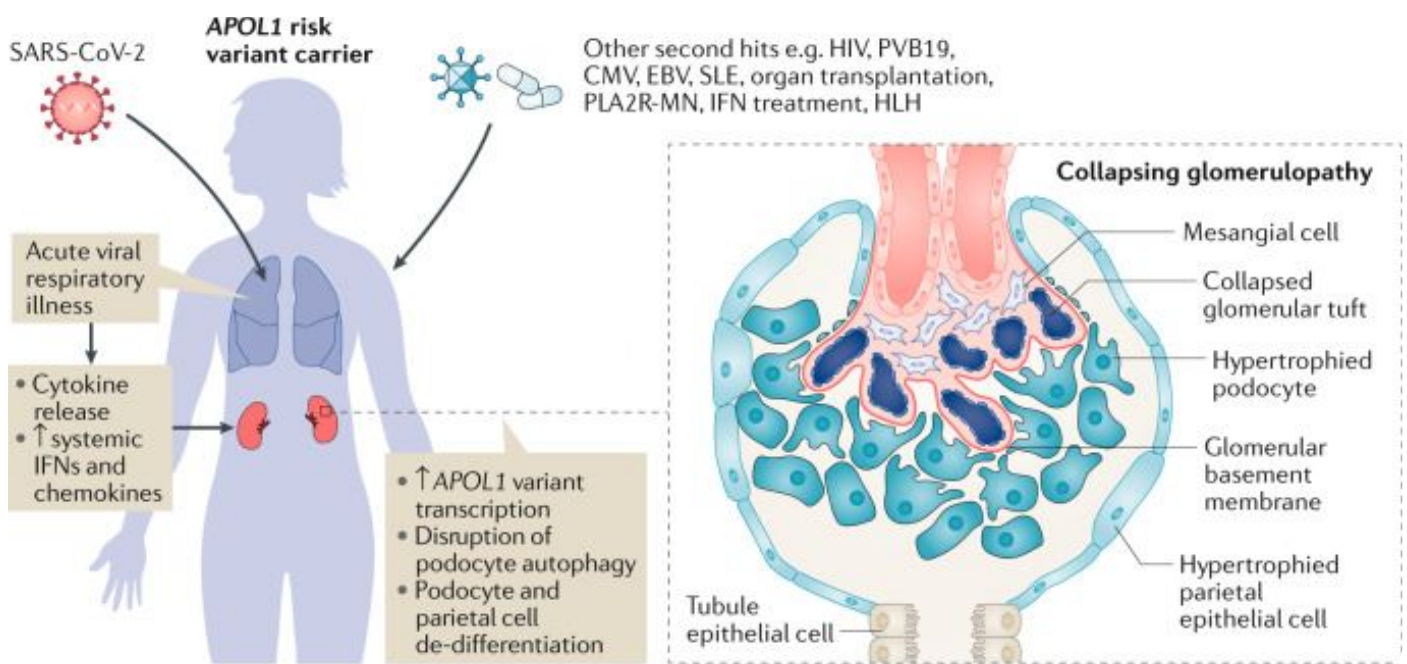
Found in pts with high risk APOL-1 genotypes, like “HIVAN”

APOL1 up-regulated by infection and inflammation

✓ podocyte injury

✓ Proteinuria

PMID: 32753739

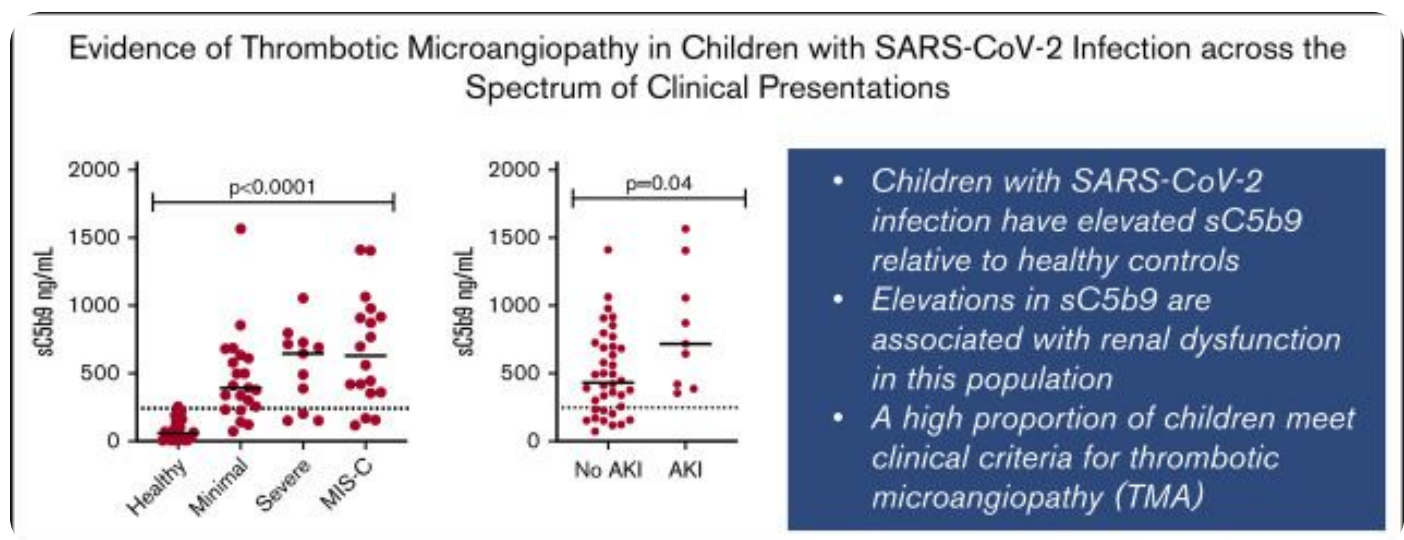


7/Thrombotic Microangiopathy is another common pathologic and clinical finding

Clinical Triad:

- ✓Thrombocytopenia
- ✓Microangiopathic Anemia
- ✓Hypertension

One pediatric study shows elevated terminal complements in severe disease and kidney dysfunction PMID: 33290544

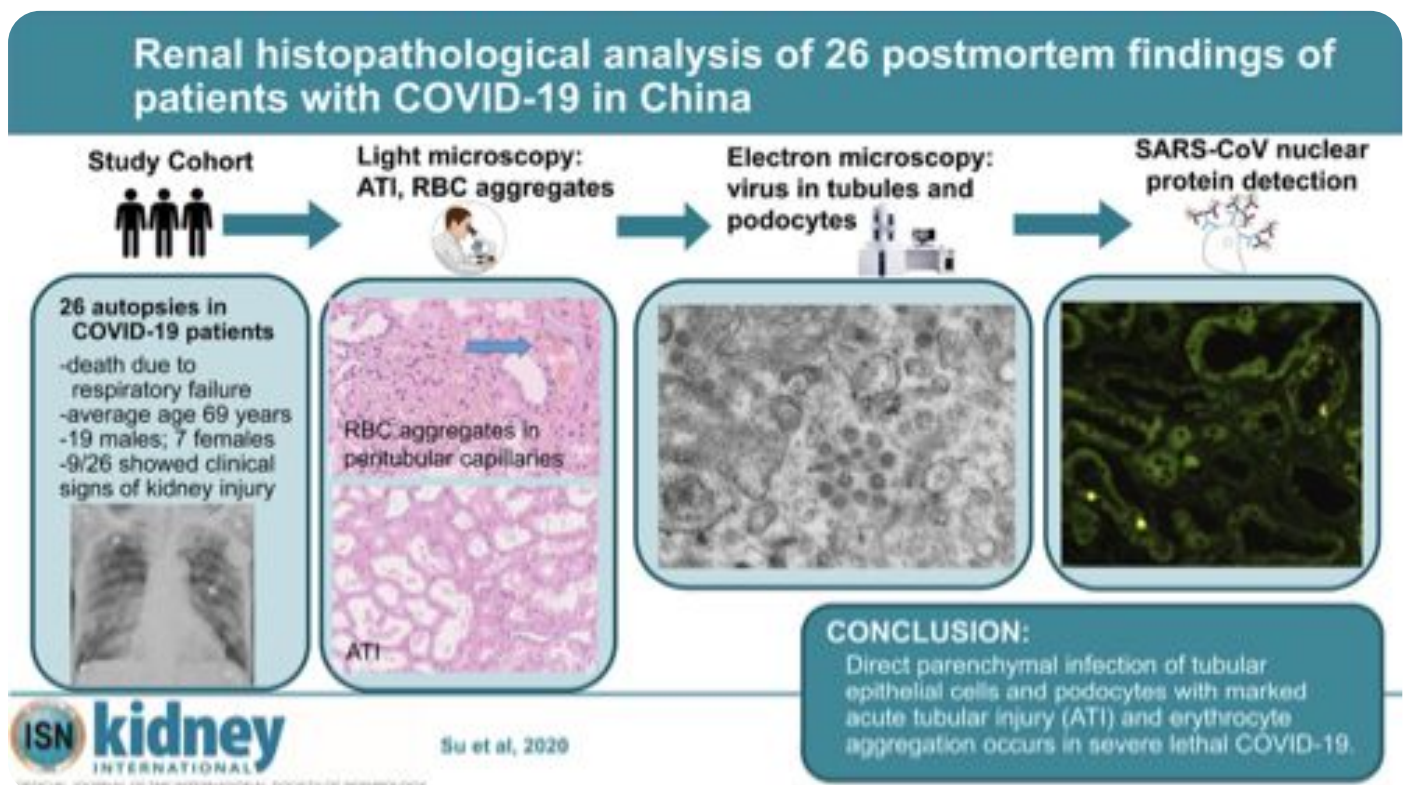


8/Let's move ahead with another question...

True or False? AKI is the result of direct infection of kidney tissue with SARS-CoV2

9/It has yet to be determined.... Early in the pandemic, evidence suggested renal tropism

- ✓ SARS-CoV2 enters cells via ACE2r
- ✓ ↑ ACE2r on proximal tubule
- ✓ Virus-like particles appreciated on EM
- ✓ in-situ hybridization (ISH) and RT-PCR from biopsy +SARS-CoV2

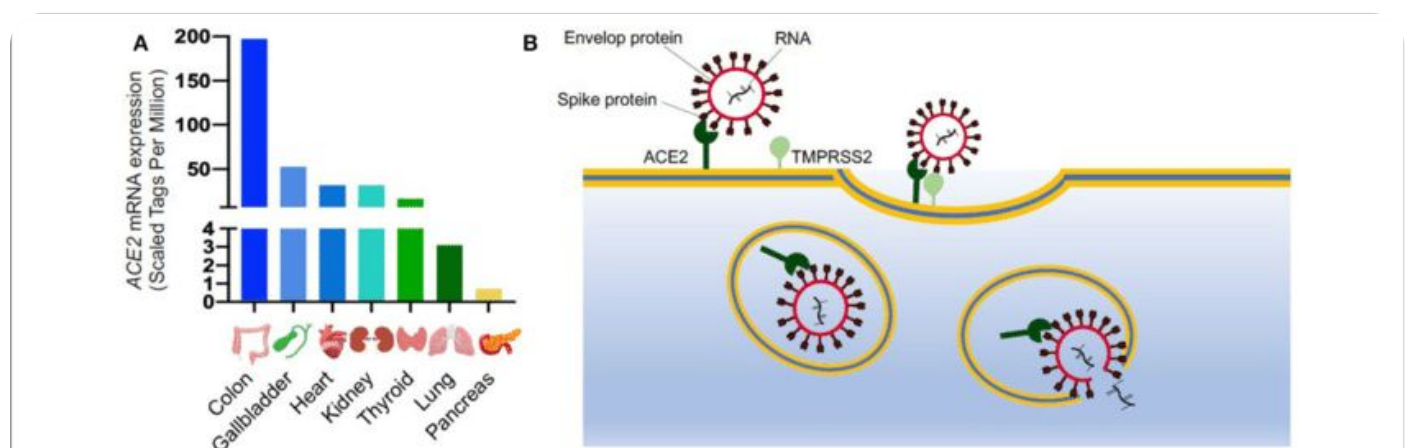


10/Currently, evidence of direct infection is less clear:

ISH & RT-PCR inconsistent for viral protein or RNA

✓ EM suggestive of endocytic vesicles, not virus

✓ Virus needs serine protease TMPRSS2, expressed in distal tubules, separate from ACE2r for entry into cell.



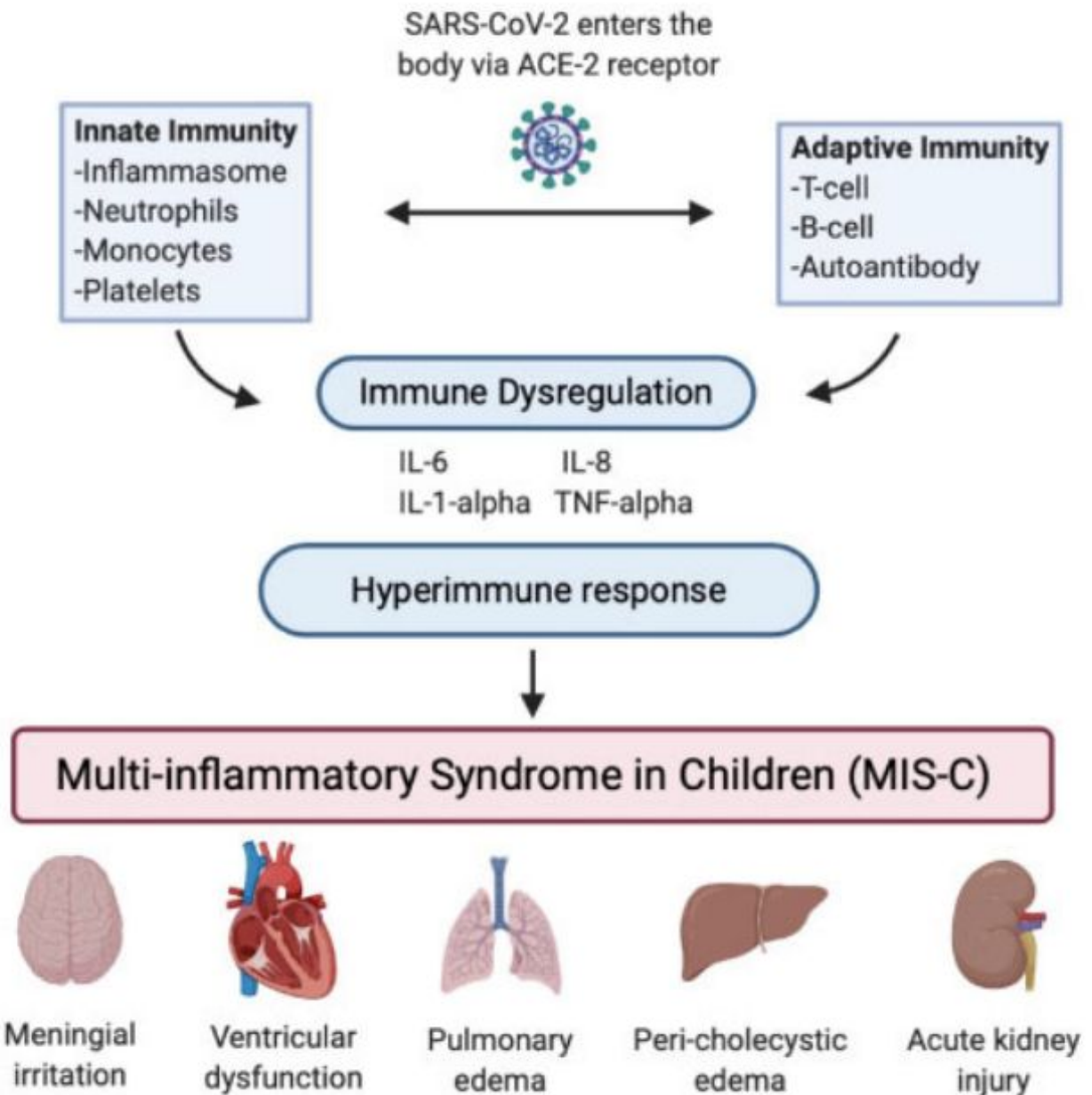
11/What about AKI and MIS-C?

Estimates from single center and systematic reviews vary 10-73%

✓ Systematic review at end of 2020: ~16% of patients with AKI, PMID: 33463127

✓ UK PICU study ~40% AKI, PMID: 33044282

✓ Inflammation ↓ LVEF, ↓ albumin associated with AKI



12/Monitoring, management and treatment of AKI?

Overall recommendation similar to treatment of typical AKI

For more info and consensus guidelines:

<https://www.nature.com/articles/s41581-020-00356-5>

<https://www.karger.com/Article/FullText/509677>



## 13/Take Home Points

✓ Pediatric COVID-19 and MIS-C ICU pts have  
↑ AKI

✓ Most common pathology (adult): ATI, collapsing  
glomerulopathy & TMA

✓ AKI multifactorial

✓ Limited histopathology

\*\*Epidemiology reported reflects data that precede  
the recent delta surge across the US



Kidney



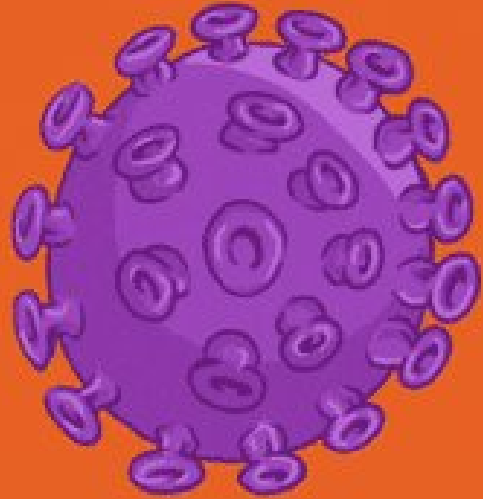
80%

10%

Covid19



# VACCINATION



#Vacúnate!

Stickerman.es

That's all for now.

For a case-based clinical discussion with a pathologist login to @ASPNePh website, Sept webinar.

#Membereducation

Thanks to @drM\_sudha @RoshanPGeorgeMD @SwastiThinks & #ASPNeFOAMgroup for your help in publishing my first tweetorial!



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