Association of SARS-CoV-2 Infection with Neurological Symptoms and Neuroimaging Manifestations in the Pediatric Population: A Systematic Review

**Background**

- **Importance:** Neurological impairments have been widely reported in adults with COVID-19.1
- **Clinical Significance:** With increasing reports of multisystem inflammatory syndrome in children, it is important to characterize their associated neurological profile.2

**Search Strategy & Methodology**

- **Eligibility Criteria:**
  - Individuals < 18 years with a confirmed first SARS-CoV-2 infection screened for structural & functional abnormalities using brain CT, MRI, PET scan, or other modalities.
  - All studies from October 2019 to present examining the impact of SARS-CoV-2 infection on pediatric brain structure & function.
  - Excluded if unconfirmed cases of COVID-19, patients with pre-existing comorbidities, studies on animals, and studies lacking explicit reporting of neurological findings.
  - **Age Stratification:**
    - Infants = 0-1 years old
    - Children = 1-11 years old
    - Adolescents = 12-18 years old

**Future Considerations**

1. Determining which subsets of the pediatric population are more susceptible to the aforementioned autoimmune conditions in order to target therapies.
2. Consider the impacts of vaccination status in the prevention of the discussed neurological abnormalities.

**Key Findings**

- **Neurological Abnormalities:**
  - MIS-C (n=258, 77.0%)
  - Encephalopathy (n=70, 20.9%)
  - Neuroinflammation (n=69, 20.6%)
  - Guillain-Barre Syndrome (n=16, 4.8%)
  - MERS (n=10, 3.0%)
  - Infarct (n=9, 2.7%)
  - Cerebral edema (n=5, 1.5%)
  - Vasculitis (n=2, 0.6%)

- **Imaging Modalities:**
  - MRI (n=141 of 211)
  - CT (n=65 of 211)
  - PET (n=7 of 211)
  - C/T/MRI (n=5 of 211)

- **Neurological Impairments on Imaging:**
  - Lesions of the corpus callosum (n=32, 9.6%)
  - PNS involvement (n=31, 9.3%)
  - CNS involvement (n=20, 6.0%)
  - Brainstem (n=15, 4.5%)
  - Cerebellum (n=12, 3.6%)
  - Frontal lobe (n=8, 1.8%)
  - Frontal-parietal cortical (n=1, 0.3%)
  - Hippocampus (n=2, 0.6%)
  - Midbrain (n=1, 0.3%)
  - Temporal lobe (n=6, 1.8%)
  - Parieto-occipital cortical (n=2, 0.6%)
  - Occipital lobe (n=1, 0.3%)
  - Occipital gyrus (n=1, 0.3%)

**Results**

- **Sample Size:** Of the total n = 6950 participants, 355 were identified with neurological symptoms or abnormal neuroimaging findings.

**References**

3. Image from: https://www.rch.org.au/kidsinfo/fact_sheets/Cerebral_Aneurysm/