

Background

- Individuals with Down syndrome (DS) are at higher risk of comorbidities identified to increase COVID-19 severity.
- The combination of immune dysregulation, cardiovascular/cardiopulmonary complications, and other risk factors may also cause a severe medical course (Espinosa et al. 2020).
- We know that individuals with DS have pre-existing conditions that result in a higher rate of hospitalization in cases of respiratory syncytial virus (RSV) and H1N1 influenza A infections. In part this is due to surging antiviral responses and stronger cytokine storms (Kantar, 2020). These reactions can result in a higher risk of secondary infection from the COVID-19 virus. Additionally, patients with DS may be at higher risk for hospitalization, including need for intensive care.

Objectives

- Define the presentation of COVID-19 in children and young adults with DS in a large study population
- Evaluate the impact of comorbidities and related complications
- Study the effect of vaccination.

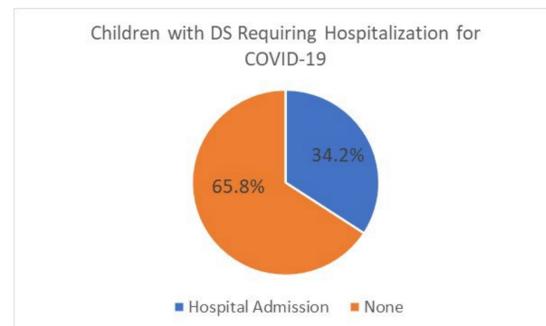
Methods

- A retrospective review of clinical data was conducted from March 2020 to April 2022 on 2,165 children and young adult patients with DS receiving care at a pediatric DS specialty clinic.
- Patients with COVID-19 diagnoses in medical records were included into the study.
- Outcomes included comorbidities, symptoms, virus severity, treatment options, and symptom duration.

Results

COVID-19 Infection: Diagnosis and Severity

- Overall, 135 children with DS had a documented COVID-19 infection.
 - Average age at COVID-19 infection was 8.91 years (SD=6.31) with 20.0% of children having a second COVID-19 infection.
- Only 10.4% of children with DS were fully vaccinated at diagnosis.
- Overall, 34.2% of children required hospitalization with an average length of stay of 2.54 days (SD=3.56).



- 20.0% of children with DS and COVID-19 had more than one diagnosis of the virus.
 - On average, the second diagnosis occurred at 11.69 years with a hospital stay of 3.15 days.

Factors that Increase Risk of Acquiring COVID-19 in Children with DS

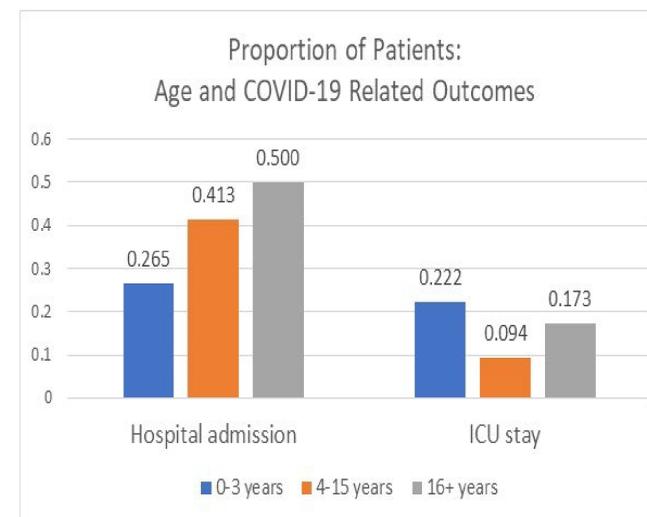
Historical comorbidities with potential impact for COVID-19 include neonatal complications, obstructive sleep apnea, laryngomalacia, recurrent pneumonia, chronic lung disease, and aspiration. Risk ratios for COVID-19 in children with DS are outlined in Table 1.

Table 1 Historical comorbidities with potential impact for COVID-19 in children with Down syndrome

Results	% of Patients with COVID-19		Risk Ratio	Significance Level
	DS With Comorbidity	DS Without Comorbidity		
Chronic lung disease	12.5%	4.6%	2.717	p < 0.001
Recurrent pneumonia	8.9%	4.9%	1.816	p < 0.001
Aspiration	8.3%	4.6%	1.804	p < 0.001
Obstructive sleep apnea	6.8%	3.8%	1.789	p < 0.001
Laryngomalacia	8.0%	4.8%	1.667	p < 0.001
NICU stay after birth	5.5%	3.7%	1.486	p < 0.001

Predictors of Severity

- C-reactive protein (mean=34.675 mg/dL vs. 5.786 mg/dL) was a significant (p < 0.05) predictor of requiring respiratory support.
 - White blood count, absolute neutrophil count, platelet count, procalcitonin, ferritin, and d-dimer levels were not predictive.
- Cochran-Armitage test of trend was run to determine whether a linear trend exists between age (0-3 years, 4-15 years, and 16+ years) and COVID-19 related outcomes. Older patients with COVID-19 more often required hospital admission; however, this did not reach a significant linear relationship (p=0.057). There was no linear trend for ICU stay, both 0-3 and 16+ patients more often required ICU admission (p=0.638).



Impact of Long COVID in Children with DS

- Long COVID was reported in 5.6% of patients.
- Long COVID symptoms reported: cough (new or above baseline), congestion/runny nose, abdominal pain, fatigue, and hypoxia.

Conclusions

- Children with DS in this study population are at high risk for hospital admission with COVID-19 infection.
- Historical comorbidities with potential impact on COVID-19 include:
 - Neonatal complications
 - Obstructive sleep apnea
 - Laryngomalacia
 - Recurrent pneumonia
 - Chronic lung disease
 - Aspiration
- Similar to the findings of Graff et.al, an elevated C-reactive protein level predicted more severe disease.
- Teens and young adults ages 16 years or older more often required hospitalization due to COVID-19 while those 0-3 years more often needed ICU care.

Implications

- Our results provide insight into the risk factors associated with COVID-19 infection as well as the outcome of COVID-19 infection in a large group of children with Down syndrome.
- We hope these results will assist practitioners with their decision-making process and any future clinical guidelines.

Citations

- [Espinosa et al. 2020]
- [Kantar, 2020]
- [Graff et.al 2021]

Disclosures

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