What are the Odds? Identifying Symptoms Associated with Obstructive Sleep Apnea in Children with Down Syndrome

Taylor Curry, MD, Kristine Wolter-Warmerdam, PhD ABD, MA, Emily Cooper, MS, Rebecca Bernstein, Francis Hickey, MD, John Brinton, PhD, Stephen Hawkins, MD, Benjamin Hughes, MD, and Emily Deboer, MD

Children's Hospital Colorado
Here, it's different.™

Affiliated with School of Medicine
UNIVERSITY OF COLORADO
ANSCHUTZ MEDICAL CAMPUS

BACKGROUND

- Obstructive sleep apnea (OSA) is common in children with Down Syndrome (DS), with wide-range of prevalence estimates: 55-98%.
- Although polysomnograms (PSG) can be difficult for some children with DS, current guidelines recommend that all children with DS undergo a PSG by age 4.
- Identifying those children with DS who are at highest risk for OSA is challenging, perhaps in part due to limited sample size of prior studies.

AIMS

- To identify symptoms and co-occurring conditions associated with OSA
- To differentiate OSA phenotypes in children with DS by analyzing other PSG variables

METHODS

- Retrospective chart review of 526 patients with DS ages 1-15 years at time of 1st diagnostic PSG at CHCO between 2012-2021 with total sleep time (TST) ≥120 min.
- Spearman correlations between O2 saturation and end-tidal CO2 by OAHI severity.
- Univariate logistic regression to predict moderate/severe OSA based on sleep symptoms and co-occurring diagnoses.
- Likelihood-ratio test to identify important predictors.

RESULTS

- Of 526 patients, 79.7% had OSA with 28.7% mild (OAHI 2-4.99), 20.0% moderate (OAHI 5-9.99), and 31.0% severe (OAHI ≥ 10).
- Severity of oxygenation and ventilation were not significantly correlated.
- History of feeding difficulties and/or pulmonary hypertension may be associated with OSA.
- Parental report of restless sleep and pauses in breathing may be associated with underlying OSA.
- Parental perception of frequency of snoring, mouth-breathing, kicking, difficulty awakening, or daytime fatigue lack evidence of an association with OAHI.

TABLE 1: Patient Demographics

	None/Mild (N=258)	Moderate/Severe (N=268)	Overall (N=526)
Age (years)			
Mean (SD)	5.51 (3.47)	5.86 (4.04)	5.69 (3.77)
Median (Q1, Q3)	4.41 (2.78, 7.46)	4.51 (2.41, 9.31)	4.43 (2.59, 8.31)
Sex			
Female	128 (49.6%)	116 (43.4%)	244 (46.5%)
Male	130 (50.4%)	151 (56.6%)	281 (53.5%)
Race			
White	183 (71.8%)	178 (68.2%)	361 (70.0%)
Black	7 (2.75%)	13 (4.98%)	20 (3.88%)
Asian	3 (1.18%)	6 (2.30%)	9 (1.74%)
Other	62 (24.3%)	64 (24.5%)	126 (24.4%)
Ethnicity			
Hispanic/Latino	107 (42.0%)	99 (38.1%)	206 (40.0%)
Not Hispanic/Latino	148 (58.0%)	161 (61.9%)	309 (60.0%)
Primary language			
English	194 (76.4%)	206 (78.3%)	400 (77.4%)
Spanish	56 (22.0%)	53 (20.2%)	109 (21.1%)
Other	4 (1.57%)	4 (1.52%)	8 (1.55%)

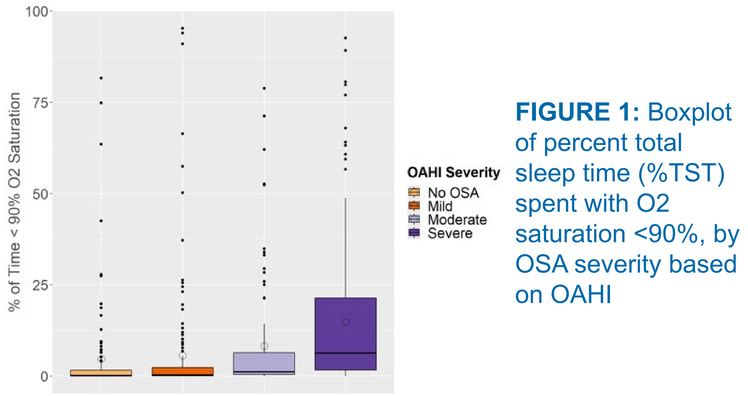

FIGURE 1: Boxplot of percent total sleep time (%TST) spent with O2 saturation <90%, by OSA severity based on OAHI

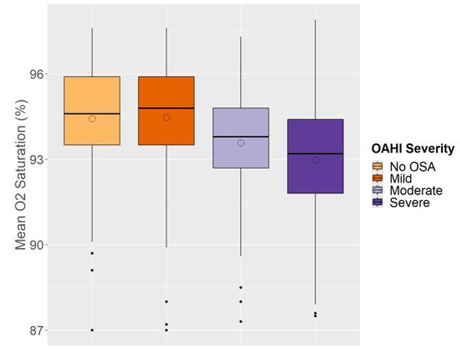

FIGURE 2: Boxplot of mean O2 saturation, by OSA severity based on OAHI

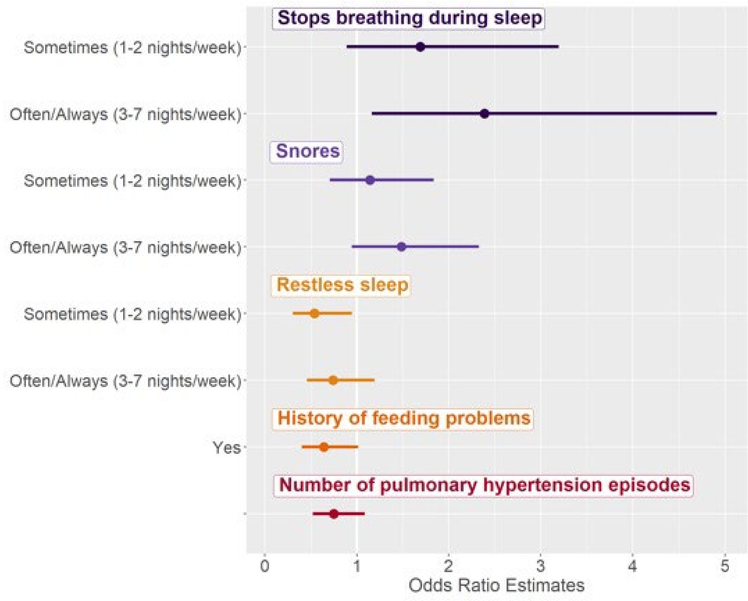

FIGURE 3: Forest plot of OR estimates and 95% CIs from univariate logistic regressions to predict moderate/severe OSA

DISCUSSION

- This large retrospective analysis of children with DS demonstrates a high prevalence (79.7%) of OSA. Of note, the prevalence increased to 90.3% when the OAHI threshold was lowered from ≥2 to ≥1.
- %TST with SpO2 <90% appears more representative of OAHI severity than mean SpO2.
- Pauses in breathing may help to screen for children at highest risk. Further validation is needed.
- Parental reports of restless sleep appears to be associated with decreased likelihood of OSA. Restless sleep may be more indicative of other conditions.

LIMITATIONS

- Some patients had undergone surgery prior to their first sleep study.
- End-tidal CO2 measurements are not always perfect.
- Our study reports on PSGs performed at 5280 ft. in elevation. These findings may not be generalizable to all patients.
- The sleep-symptom questionnaire was inconsistently completed.
- Univariate analyses may not control for all confounding variables.

DISCLOSURES

The authors have no conflicts of interest or financial disclosures with respect to the research, authorship, and/or publication of this article.