31

Sleep disturbance and school engagement in children with cystic fibrosis during the COVID-19 pandemic

B. Wisniewski[1], K. Swegheimer[2], T. Boat[2,3], M. Hjelm[2,3]. [1]*Sleep Center, Division of Pulmonology and Sleep Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH;* [2]*Pulmonary Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH;* [3]*Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, OH*

Background: Alterations in sleep limit quality of life of children with chronic diseases, especially those in vulnerable patient populations, such as children with cystic fibrosis (CF). Children with CF are more likely to have disrupted sleep and diminished sleep quality than those without even when corrected for measures of disease severity. Parents of children with CF have also been shown to have insufficient sleep duration and daytime sleepiness that positively correlates with the sleep disturbances in their children [1]. No published studies describe the relationship between sleep disturbance and school engagement in pediatric CF populations during the COVID-19 pandemic.
Methods: A pilot prospective cross-sectional observational study in school-aged children with CF was initiated at Cincinnati Children's Hospital Medical Center in July 2021, with planned ongoing enrollment until May 2022. A COVID-19-specific school engagement questionnaire was developed, and data were collected. Information on patient diagnoses, medications, demographic characteristics, Epworth Sleepiness Score for Children and Adolescents (ESS-CHAD), Pediatric Insomnia Severity Index (PISI), Pittsburgh Sleep Quality Index (PSQI), sleep diaries, and academic report card data is being recorded. Descriptive statistics were performed.
Results: Of 23 school-aged children with CF enrolled, 11 children aged 5 to 18 (median age 10; 63.6% female) have available data. Eight (72.7%) had insufficient sleep duration according to American Academy of Sleep Medicine consensus guidelines. Mean ESS-CHAD was 7 (range 2–12), and two (18.2%) met criteria for subjective mild excessive daytime sleepiness. Median range of absences during a given academic year was 6 to 10 days. Subjects had participated in a variety of learning methods during the past academic year: virtual (n = 6), in-person (n = 4), hybrid (n = 4), home-school (n = 1). Five (45.5%) parents reported being afraid of their child becoming sick or contracting COVID-19 through school-related activities, two (18.2%) believed that the pandemic had worsened their child's sleep and affected their academic performance, and all 11 (100%) felt that their child's academic performance was stable or improving after a transition to mostly in-person instruction this academic year.
Conclusions: Preliminary data from ongoing enrollment in this pilot study suggest that the COVID-19 pandemic has harmed sleep and school engagement in some children with CF. Academic performance subjectively improved after a return to mostly in-person instruction. Sleep disturbance may be an underappreciated aspect of the pediatric CF care model. We have limited understanding of the approaches needed for sleep-related screening, diagnosis, and clinical management. Additional data and analyses will be reported at the 2022 North American Cystic Fibrosis Conference.
Acknowledgements: Cystic Fibrosis Foundation: 4th Year Clinical Fellowship Award (WISNIE21D0); Cincinnati Children's Research Foundation.

Reference

[1] Byars KC, Chini B, Hente E, Amin R, Boat T. Sleep disturbance and sleep insufficiency in primary caregivers and their children with cystic fibrosis. *J Cyst Fibros* 2020;19(5):777–82.

32

Characteristics of 225 infants with cystic fibrosis screen positive, inconclusive diagnosis and cystic fibrosis transmembrane conductance regulator–related metabolic syndrome identified in New York State over a 3-year period

C. Kier[1], H. Sadeghi[2], D. Kay[3], E. Langfelder-Schwind[4], M. Berdella[5], D. Joan[6], Z. Soultan[7], M. Caggana[3], A. Dozor[8], C. Fortner[9], R. Giusti[10], D. Goetz[11], R. Kaslovsky[12], C. Stevens[3], K. Voter[13], J. Welter[8],
New York State Cystic Fibrosis Newborn Screening Consortium[3,14]. [1]*Stony Brook Children's Hospital, Stony Brook Medicine, Stony Brook, NY;* [2]*Pediatric Pulmonology, Columbia University Irving Medical Center, New York, NY;* [3]*Newborn Screening Program, Wadsworth Center, New York State Department of Health, Albany, NY;* [4]*Mount Sinai Beth Israel, New York, NY;* [5]*Cystic Fibrosis Center at Mount Sinai Beth Israel, Department of Medicine, Icahn School of Medicine at Mount Sinai, New York, NY;* [6]*Cohen Children's Medical Center, New Hyde Park, NY;* [7]*State University of New York, Upstate Medical University, Syracuse, NY;* [8]*Westchester Medical Center, Westchester, NY;* [9]*Pediatrics, State University of New York Upstate Medical University, Syracuse, NY;* [10]*Pediatric Pulmonology, Hassenfeld Children's Hospital, New York University Langone Health, New York, NY;* [11]*University of Buffalo Medical Center, Buffalo, NY;* [12]*Albany Medical College, Albany, NY;* [13]*Pediatrics, University of Rochester Medical Center, Rochester, NY;* [14]*Cystic Fibrosis Specialty Care Centers, New York, NY*

Background: New York State (NYS) added third-tier sequencing to its immunoreactive trypsinogen (IRT)–deoxyribonucleic acid (DNA) cystic fibrosis (CF) newborn screening (CF NBS) algorithm on December 1, 2017, to reduce false-positive referrals. NYS refers infants with high IRT and two or more CF transmembrane conductance regulator *(CFTR)* variants, including variants of potential clinical significance for diagnostic evaluation, to one of 10 CF specialty care centers (SCCs). Findings of intermediate or normal sweat chloride (Cl^-) levels (<60 mmol/L) in these infants, consistent with published criteria for CF screen positive, inconclusive diagnosis (CFSPID)/*CFTR* transmembrane conductance regulator–related metabolic syndrome (CRMS), poses challenges to clinicians and families. The aim of this descriptive study is to describe NYS CF NBS results and findings from initial and follow-up evaluations of CFSPID/CRMS infants identified since the algorithm change.
Methods: As part of long-term follow-up, a clinical and demographic dataset was compiled from SCCs for infants with high IRT and at least two *CFTR* variants (with one or more not clearly CF-causing) referred between December 1, 2017, and November 30, 2021. Genotypes and *CFTR* phasing were abstracted from NYS NBS records. Sweat Cl^-, oropharyngeal culture (OPS), fecal elastase, CF status, and race and ethnicity data were requested from the SCCs. The NYS Department of Health Institutional Review Board considered the project exempt.
Results: Over the 3-year period, *CFTR* phasing was determined for 193 of 290 infants that the NBS identified as not having CF, 14.5% (28/193) were confirmed in cis and reclassified as likely carriers, 5.5% (16/290) were determined to be carriers after variant reclassification, 5.8% (17/290) were lost to follow-up or parental refusal, and 77% (225/290) were evaluated at least once at a SCC and classified as CFSPID/CRMS. The most common variant was 5T-12TG (40% (90/225) carried at least one copy). Sweat Cl^- values for CFSPID/CRMS infants were higher than for carriers, although there was overlap. None of the infants with *CFTR* variants in cis had sweat Cl^- greater than 25 mmol/L, two had insufficient quantity of specimen, and three were not sweat tested. For the highest reported sweat Cl^- value for each infant classified as CFSPID/CRMS, most infants had low sweat Cl^- (39% (88/225) <20 mmol/L; 42% (95/225) 20–29 mmol/L; 11.5% (26/225) 30–39 mmol/L; 5% (12/225) 40–49 mmol/L); 1.7% (4/225) had sweat Cl^- of 50 to 59 mmol/L (W1282X//5T-12TG, n = 3; R117H-5 T//5T-12TG, n = 1). Decreasing sweat Cl^- trend was seen in 5.3% (n = 12), increasing trend in 7.1% (n = 16), and variable trend in 0.9% (n = 2). Oropharyngeal swab cultures from two of 110 infants, who had sweat Cl^- levels of 12 mmol/L and 10 mmol/L, showed isolated *Pseudomonas aeruginosa*. Of 113 infants with fecal elastase values, 112 were reported as normal. One infant with sweat Cl^- of 28 mmol/L and 31 mmol/L at 17 days of life had a low initial value indicative of malabsorption; results were normal on repetition.
Conclusions: None of the 225 CFSPID/CRMS infants converted to a CF diagnosis during the 3-year period. Sweat Cl^- values remain low in most