RACE, SLEEP TESTING, AND TREATMENT DIFFERENCES BETWEEN NARCOLEPTIC PEDIATRIC POPULATIONS WITH AND WITHOUT CATAPLEXY: A FEDERATED ELECTRONIC MEDICAL RECORD (EMR) NETWORK ANALYSIS

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BACKGROUND

- Narcolepsy is primarily a sleep disorder and one of the most important causes of excessive daytime sleepiness in children.[1]
- Diagnosis is often delayed by up to 12 years, as its signs and symptoms are often confused with other conditions and because of the absence of easily measurable biomarkers.[2,3]
- Two types of narcolepsy exist, narcolepsy with cataplexy or type 1 (NT1), and narcolepsy without cataplexy or type 2 (NT2). Cataplexy is characterized by one or more sudden short-term (<2 minutes) losses of muscle tone (often due to an emotional trigger), yet consciousness is retained.[4]
- Few studies to date have compared pediatric patients with NT1 and NT2, including demographic characteristics and treatment patterns.

OBJECTIVES

- Compare demographic and clinical characteristics of pediatric patients prior to diagnosis with NT1 and NT2
- Compare narcolepsy recommended treatment rates within 1-year post-diagnosis among pediatric patients diagnosed with NT1 and NT2

METHODS

Study Design: Retrospective propensity score matched cohort study

Data Source
- TriNetX EMR Research Data Network
- A federated EMR network of 26 academic medical centers, physician specialty practices, and specialty hospitals across the U.S. treating a total of 35.4 million patients

Patient Selection
- Patients aged ≤17
- Diagnosis of NT1 (ICD-10: G47.411,G47.421) and no evidence of NT2 (G47.419, G47.429) or NT2 alone on ≥2 visits at least 1 month to 1 year apart

Baseline Characteristics
- Demographics – age, sex, race
- Symptoms using ICD-10-CM codes
- Sleep study use 1-year before diagnosis (index) – CPT4 codes

Outcomes
- Recommended prescription drug use 1-year post diagnosis

Statistical Analysis
- T-test and chi-square tests as appropriate for baseline characteristics
- Odds ratios (OR) and 95% CI for post-index prescription drug use
- All analyses conducted using the TriNetX Analytics Platform

RESULTS

Patient Demographics
- Pediatric study cohorts consisted of 115 NT1 and 299 NT2 patients (Table 1).
- The racial distributions of the NT1 and NT2 cohorts differed significantly with:
  - The proportion of white patients in the NT1 cohort being more than 2x that of black patients (56% vs 26%)
  - Similar proportions of NT2 patients being black (42.8%) or white (42.1%).
- NT2 patients were diagnosed at an older age than NT1 patients 11.3 ± 3.5 vs. 10.1 ± 4.4 years, *P*<0.001.

Pre-Index Narcolepsy Symptoms and Associated Diagnoses
- While not significantly different, pre-index symptoms of narcolepsy – snoring (R06.83: 21.4% vs. 17.4%), malaise and fatigue (R53: 13.4% vs. 10.4%), behavioral and emotional disorders (F90-F98: 12.4% vs. 8.7%), and asthma (J45: 13.7% vs. 8.7%) were greater in NT2 compared to NT1.
- Lack of expected physiologic development (R62: 4.3% vs. 8.7%) was about half the prevalence in NT2 compared to NT1, but did not reach statistical significance, *P*=0.084.
- The prevalence of oppositional defiance disorder was significantly lower for NT2 compared to NT1 (3.3% vs 8.7%; *P*=0.023).
- For NT2 compared to NT1 patients, there were no differences in the periodic breathing (R06.3: 10.0% vs. 9.6%), somnolence (R40.0: 6.7% vs. 8.7%), dyspnea (R06.0: 11.4% vs. 9.6%), overweight and obesity (E66: 14.0% vs. 13.0%), ADHD (F90: 9.7% vs. 8.7%), or major depressive disorders (F32-F33: 7.7% vs. 8.7%).

Pre-Index Narcolepsy Prescription Medications & Sleep Testing (Figure 1 and Table 2)
- Use of amphetamines and antidepressants were significantly lower in the NT2 compared to NT1 cohorts prior to diagnosis of narcolepsy.
- Bronchodilator and antihistamine use were both greater in the NT2 cohort, however, only use of bronchodilators was significantly greater (24.7% vs. 8.7%, *P*<0.001).
- Nearly 40% of patients with NT2 underwent sleep testing prior to diagnosis compared to nearly 18% of those diagnosed with NT1, *P*<0.001.

Table 1. Patient demographics

Demographic Characteristic		NT1 n = 115	NT2 n = 299	*P* –value
Male		42.6%	47.8%	0.340
Race	White	55.6%	42.1%	<0.001
	Black	26.1%	42.8%	
	Other	3.5%	1.5%	
	Unknown	14.8%	13.6%	
Age at Diagnosis (years)	0-4	14.6%	3.4%	0.001
	5-9	28.1%	30.7%	
	10-14	36.5%	45.6%	
	15-17	20.8%	20.3%	

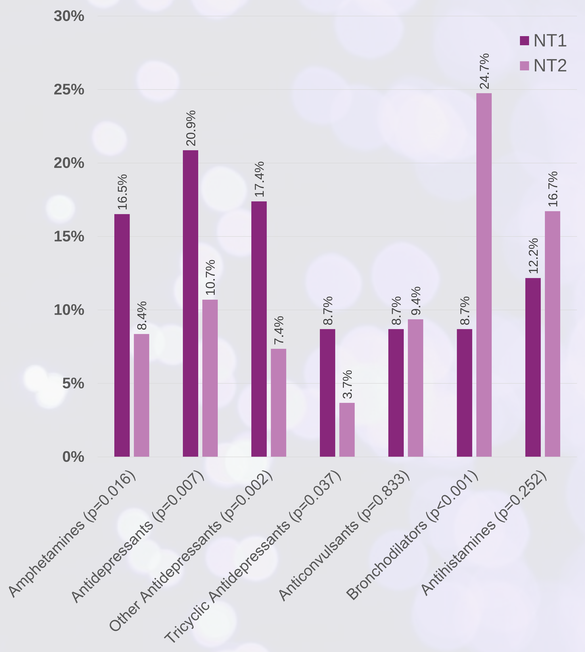

Figure 1. Pre-index medications

Table 2. Pre-index sleep testing

Test Type	NT1 n = 115	NT2 n = 299	*P*-Value
Overall	17.7%	39.9%	<0.001
Polysomnography	17.7%	38.2%	<0.001
Multiple Sleep Latency Testing	10.4%	31.4%	<0.001

- Nearly 40% of patient diagnosed with NT2 underwent sleep testing prior to diagnosis compared to nearly 18% of those diagnosed with NT1, *P*<0.001

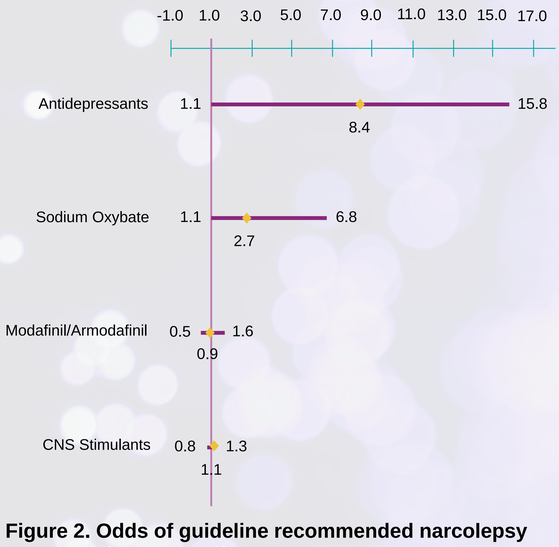

Figure 2. Odds of guideline recommended narcolepsy treatment (NT1 vs NT2)

- Post-index antidepressant [32.2% vs. 5.3%, *P*<0.001; OR 8.4 (4.4,15.9)] and sodium oxybate [8.7% vs. 3.3%, *P*=0.023; OR 2.7 (1.1,6.8)] use was significantly greater in NT1 than NT2..
- Modafinil/armodafinil (17.4% vs. 18.4%) and CNS stimulants (44.3% vs. 41.8%) were similarly utilized in both cohorts, *P*=0.812 and *P*=0.639

CONCLUSIONS

- This is one of a few studies to compare pediatric patients with and without cataplexy in a real-world setting and the only one known to use electronic medical records for analysis.
- A significant difference in the racial distribution of pediatric narcolepsy patients diagnosed with and without cataplexy was observed, but it is unknown if this difference remains in adult patients diagnosed with narcolepsy.
- While not all patients underwent sleep testing prior to their diagnosis, a greater proportion of those ultimately diagnosed without cataplexy had.
- Antidepressant treatment is not recommended in the absence of cataplexy,[4] however a small proportion of patients did remain on treatment following their diagnosis.
- CNS stimulants and modafinil/armodafinil, not recommended in the presence of cataplexy,[4] were both used for large proportions of these patients.

References

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ISPOR Europe 2019 | Copenhagen, Denmark