

# Validity of Sleep Related Breathing Disorder Scale(SRBD) and Anthropometrics in Obese/Overweight Children with Obstructive Sleep Apnea (OSA)

L. Lozada MD; J. Brubaker; N. Thompson; R. Honomichl; R. Mehra MD; V. Shah MD  
Cleveland Clinic Sleep Disorders Center, Cleveland Clinic, Cleveland, Ohio.

## Introduction

- Prevalence of OSA, a multifactorial disorder associated with significant morbidity, has increased due to the pediatric obesity epidemic.
- A key existing gap is lack of a valid OSA screening tool in overweight/obese pediatric patients incorporating anthropometrics.
- We proposed the first analysis to assess respiratory changes in SEEG recorded seizures using a multimodal system integrating electroencephalographic, respiratory and polysomnographic signals.

## Objectives

- Aim 1:** Examine the validity of SRBD scale in detecting OSA (AHI  $\geq 5$  and AHI  $\geq 10$ ) in overweight/obese patients.
- Aim 2:** Examine whether adding SRBD total score to prediction model of OSA containing demographic and/or physical exam findings improves prediction accuracy in overweight/obese patients.

## Methods

- Consecutive obese/overweight(n=89) patients(body mass index-BMI percentile>85th for age/gender) in obesity management clinic with SRBD scale, polysomnogram(PSG) and anthropometrics (neck circumference (NC),waist circumferences(WC), height), systolic and diastolic blood pressure(BP) percentiles are included.
- Receiver operating characteristic(ROC) analysis with AHI as the outcome variable, sensitivity, specificity, positive(PPV), negative predictive values(NPV) for an SRBD cutoff score of 8 and SRBD score found using Youden's index in ROC and 95% confidence intervals using the exact binomial method are presented.
- Prediction model, interaction and discrimination (Outcome:AHI; Independent: age, sex, WC, NC, SRBD) were analyzed.

## Results

- Study population characteristics: age 12.6 $\pm$ 3.4years, 55% female, 62% non-white and AHI=13.0 $\pm$ 20.7,AHI $\geq$ 5=65.1% and AHI $\geq$ 10=37.1%.
- No significant differences were noted in item endorsement or SRBD total score using either AHI $\geq$ 5 or AHI $\geq$ 10 (all P>0.10). (**Table 1**).
- Using SRBD total score as a predictor and AHI  $\geq 5$  and AHI  $\geq 10$  as outcomes, the area under the ROC curve (**Figure 1**) was 0.491 (95% CI = 0.352–0.630) and 0.559 (95% CI = 0.439–0.679). This indicates that in this cohort, using SRBD to predict AHI  $\geq 5$  or AHI  $\geq 10$  is no better than chance.
- The SRBD cutoff score for Youden's index was 7 for both AHI cutoffs of 5 and 10 and produced similar results to using SRBD cutoff score of 8.

**Table 1. Sensitivity, Specificity, Positive and Negative Predictive Values**

	AHI $\geq 5$	AHI $\geq 10$
	SRBD $\geq 8$ †	SRBD $\geq 8$ †
Sensitivity	0.76 (0.63, 0.86)	0.85 (0.68, 0.95)
Specificity	0.39 (0.22, 0.58)	0.38 (0.25, 0.52)
Positive Predictive Value	0.70 (0.57, 0.81)	0.44 (0.32, 0.58)
Negative Predictive Value	0.46 (0.27, 0.67)	0.81 (0.61, 0.93)

† – An SRBD total score of 8 is equivalent to using 0.33 as the proportion of endorsed SRBD items

**Table 2. Multivariable Logistic Regression Models**

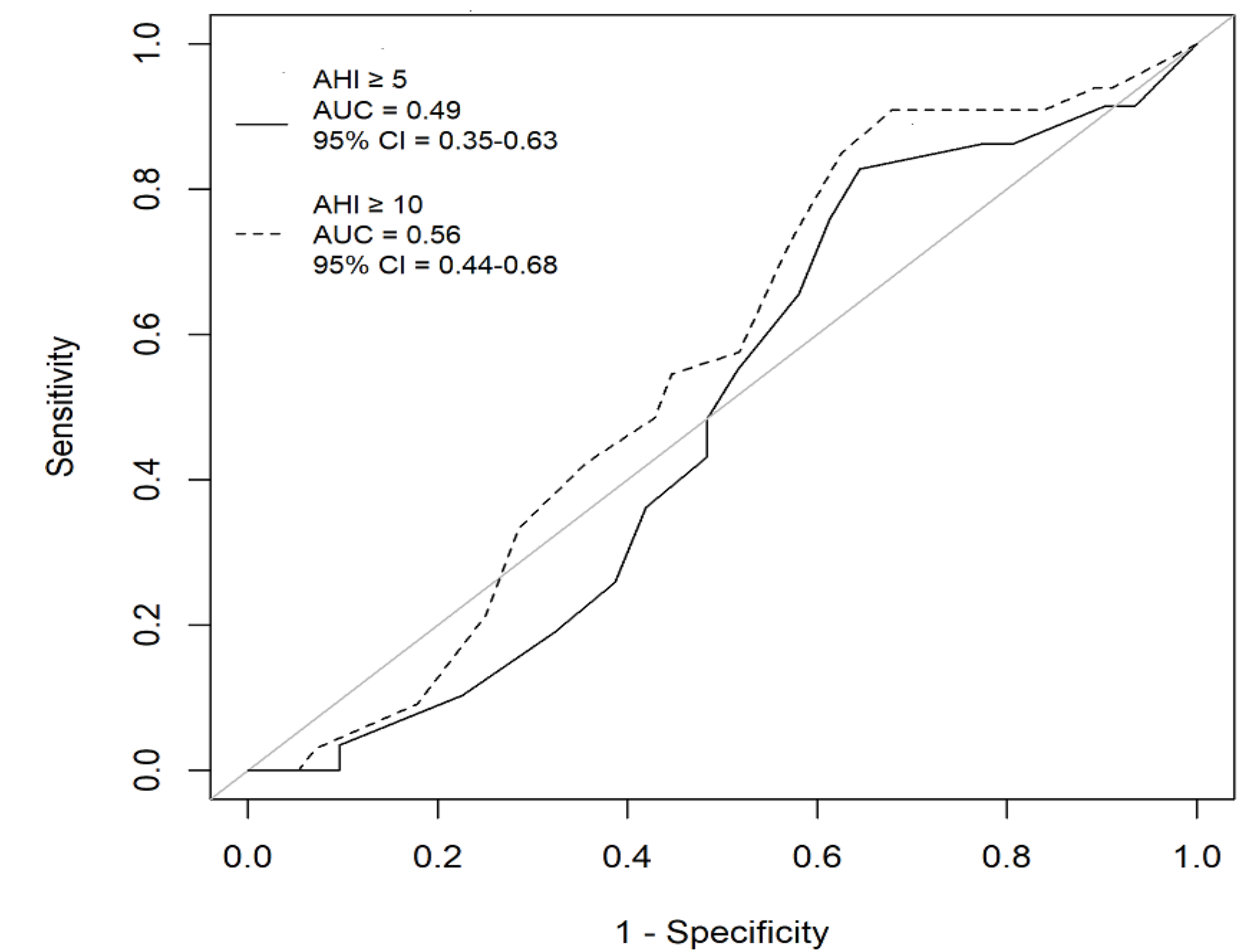
**Table 2.A** Multivariable Logistic Regression Model with AHI  $\geq 5$

	Model 1		Model 2	
	Odds Ratio (95% CI)	P-value	Odds Ratio (95% CI)	P-value
Age (per year)	0.97 (0.79, 1.19)	0.78	0.97 (0.79, 1.20)	0.76
Male (vs. Female)	0.03 (0.00, 1.93)	0.10	0.03 (0.00, 1.93)	0.10
Waist Circumference (per cm)	1.03 (0.99, 1.06)	0.12	1.03 (0.99, 1.06)	0.12
Age $\times$ Male	1.50 (1.04, 2.16)	0.03	1.51 (1.04, 2.19)	0.03
SRBD Total Score			1.01 (0.91, 1.12)	0.85

**Table 2.B** Multivariable Logistic Regression Model with AHI  $\geq 10$

	Model 1		Model 2	
	Odds Ratio (95% CI)	P-value	Odds Ratio (95% CI)	P-value
Age (per year)	0.89 (0.72, 1.10)	0.27	0.88 (0.71, 1.09)	0.23
Male (vs. Female)	0.02 (0.00, 1.12)	0.06	0.02 (0.00, 0.91)	0.05
Waist Circumference (per cm)	1.01 (0.98, 1.04)	0.39	1.01 (0.98, 1.04)	0.43
Age $\times$ Male	1.39 (1.04, 1.86)	0.03	1.43 (1.06, 1.93)	0.02
SRBD Total Score		0.27	1.07 (0.97, 1.17)	0.20

**Figure 1**



- The prediction models including age, sex and WC (NC was not significant) had optimism-corrected c-statistics of 0.724 and 0.627 for AHI $\geq$ 5 and 10, respectively(**Table 2**). Adding SRBD total score to the models actually reduced these values to 0.702 and 0.614.

## Conclusions

- SRBD alone has fair sensitivity, but poor specificity for significant OSA in overweight/obese.
- The addition of anthropometrics to SRBD decreased discrimination of OSA in prediction models.
- Anthropometrics may differ in pre pubertal and post pubertal phenotypes of OSA and may or may not aid in increasing predictability of OSA with SRBD in overweight and obese patients.

## Conclusions

NICORE scholar biostatistics support.