

# REFERENCE VALUES FOR NOCTURNAL HOME POLYSOMNOGRAPHY IN CHILDREN

Urschitz MS <sup>1,2</sup>, Moss DM <sup>3</sup>, Nöhren A <sup>3</sup>, Urschitz-Duprat PM <sup>3</sup>, Schlaud M <sup>4</sup>, Poets CF <sup>1</sup>



<sup>1</sup> Department of Neonatology, University of Tuebingen, Tuebingen, Germany

<sup>2</sup> Division of Neonatology, Department of Pediatrics, Vienna General Hospital, University of Vienna, Vienna, Austria

<sup>3</sup> Department of Pediatric Pulmonology and Neonatology, Hannover Medical School, Hannover, Germany

<sup>4</sup> Department of Epidemiology, Social Medicine and Health System Research, Hannover Medical School, Hannover, Germany

## INTRODUCTION

- Nocturnal home polysomnography (NHPSG) is an alternative to sleep laboratory polysomnography for the assessment of sleep-disordered breathing (SDB) in adults.<sup>1</sup> Advantages include convenience, patient acceptability and costs.
- Despite these advantages, NHPSG is not yet commonly used to diagnose pediatric SDB. One reason for this is the lack of appropriate reference values. Aim of this study was to obtain respiratory reference values for children undergoing NHPSG.

## METHODS

- As part of a population-based, cross-sectional study on the prevalence of SDB in primary school children, 52 children without signs or symptoms of SDB were systematically selected from the study cohort of 1144 children.
- Overnight NHPSG was performed in the children's home using a portable device (Embletta PDS<sup>®</sup>, Flaga<sup>®</sup>; Reykjavik, Island). All analysis was done with software provided by the device manufacturer (Somnologica for Embletta<sup>®</sup>, version 3.0, Flaga<sup>®</sup>; Reykjavik, Island).
- Recordings were manually analyzed for central apneas (CA), obstructive apneas (OA), mixed apneas (MA), hypopneas (H), and desaturations by  $\geq 4\%$  SpO<sub>2</sub> (D4) and to  $\leq 90\%$  SpO<sub>2</sub> (D90).
- Minimal duration for all respiratory events was 2 breath cycles.
- Indices were calculated as events per hour of recording time for CA (CAI), OA (OAI), MA (MAI), H (HI), D4 (DI4), and D90 (DI90) as well as for OA+MA (MOAI) and OA+MA+H (MOAHI) to represent all obstructive events per hour and for CA+OA+MA+H (RDI) to represent all respiratory events per hour.

## RESULTS

- There were 26 girls (50%). Mean (SD) age and BMI was 10.1 years (0.6) and 16.8 (2.1) at the time of recording.
- Median (IQR; range) values for CAI, OAI, MAI, and HI were 1.6 (1.1-2.2; 0.2-5.0), 0.0 (0.0-0.0; 0.0-1.6), 0.0 (0.0-0.0; 0.0-0.12), and 0.0 (0.0-0.0; 0.0-0.6; Figure 1). Median (IQR; range) values for DI4 and DI90 were 0.5 (0.2-1.0; 0.0-3.7) and 0.0 (0.0-0.0; 0.0-0.6; Figure 1).
- All recordings included at least one CA. Mean (SD; range) duration of CA was 11.5 seconds (3.9; 5.4-38.5). Eleven recordings (21%) showed prolonged CA of > 20 seconds duration and 11 recordings (21%) had at least one CA followed by a desaturation to  $\leq 90\%$ .
- OA occurred in 11 recordings (21%), with a mean (SD; range) duration of 15.9 seconds (6.9; 6.2-40.6). No OA was associated with a desaturation to  $\leq 90\%$ .
- Two recordings presented one MA each, both were associated with a desaturation by 5%.
- Eight recordings (15%) had one or more H, with a mean (SD; range) duration of 11.7 seconds (4.2; 6.4-19.1). No H was associated with a desaturation to  $\leq 90\%$ .
- Median (IQR; range) values for MOAI, MOAHI, and RDI were 0.0 (0.0-0.0; 0.0-1.6), 0.0 (0.0-0.1; 0.0-1.6), and 1.7 (1.1-2.3; 0.2-5.8; Figure 2 and Table 1). The upper limits of the reference range for MOAI, MOAHI (not normally distributed), and RDI (normally distributed) were 0.4 (95<sup>th</sup> centile), 0.6 (95<sup>th</sup> centile), and 4.3 (mean + 2 SD; Table 1).

## CONCLUSION

- CA were found in all children. Both CA of >20 seconds duration and CA with desaturations to  $\leq 90\%$  occurred in these primary school children.
- OA and H were rare and were found in 21% and 15% of children.
- MA were extremely rare and were present only in 4% of children.
- These reference values may serve as a basis for the interpretation of NHPSG recordings in children referred for SDB.

## REFERENCES

- American Sleep Disorders Association and Sleep Research Society: Practice parameters for the use of portable recording in the assessment of obstructive sleep apnea. Sleep 1994;17:372-277

## BOXPLOTS OF INDICES

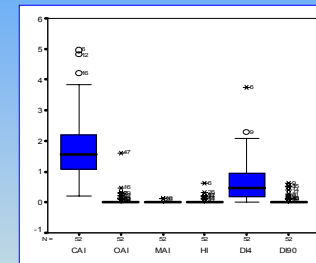


Figure 1.

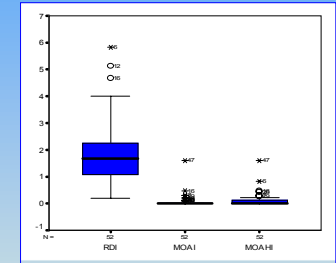


Figure 2.

## DESCRIPTIVE STATISTICS

|       | Mean $\pm$ SD | Median | IQR     | Range     | Upper Limit |
|-------|---------------|--------|---------|-----------|-------------|
| RDI   | 1.9 $\pm$ 1.2 | 1.7    | 1.1-2.2 | 0.2 - 5.0 | 4.0*        |
| MOAI  | 0.1 $\pm$ 0.2 | 0.0    | 0.0-0.0 | 0.0 - 1.6 | 0.4**       |
| MOAHI | 0.1 $\pm$ 0.3 | 0.0    | 0.0-0.1 | 0.0 - 1.6 | 0.6**       |

Table 1.

Depending on data distribution, upper limit given as mean + 2 SD \* or 95<sup>th</sup> centile \*\*  
IQR, interquartile range (25<sup>th</sup>-75<sup>th</sup> centile)