

Reference values for nocturnal home polysomnography in school children

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BACKGROUND

Nocturnal home polysomnography (NHPSG) is an alternative to standard polysomnography for the assessment of obstructive sleep apnea syndrome (OSAS) in adults¹. Advantages include convenience, patient acceptability and costs. Despite these advantages, NHPSG is not yet commonly used to diagnose pediatric OSAS. One reason for this is the lack of appropriate reference values. Aim of this study was to obtain respiratory reference values for primary school children undergoing NHPSG.

METHODS

- As part of a study on the prevalence of sleep disordered breathing (SDB) in primary school children, 48 children were systematically selected from a population-based study cohort of 1144 children.
- Overnight NHPSG was performed in the children's home using a portable device (Embletta PDS[®], Flaga^{hf}; Reykjavik, Island). All analysis was done with software provided by the device manufacturer (Somnologica for Embletta[®], version 3.0, Flaga^{hf}; Reykjavik, Island).
- Recordings were manually analyzed for central apneas (CA), obstructive apneas (OA), mixed apneas (MA), hypopneas (H), and desaturations by $\geq 4\%$ SpO₂ (D4) and to $\leq 90\%$ SpO₂ (D90). Change of body position (CBP) and percent snoring time (PST) were automatically analyzed by the software.
- Minimal duration for all respiratory events was 2 breath cycles.
- Indices were calculated as events per hour of recording time for CA+MA+OA+H (AHI) to represent all respiratory events per hour, MA+OA+H (MOAHI) to represent all obstructive events per hour, OA (OAI), D4 (DI4), D90 (DI90) and change of body position (CBPI).

RESULTS

- There were 23 girls and 25 boys. Mean (SD) age, height and weight were 10.0 y (0.6), 139.4 cm (6.4) and 33.2 kg (5.2).
- Median (range; 95th centile) values for **AHI**, **MOAHI**, **OAI**, **DI4** and **DI90** were 1.7 (0.0-5.8; 4.9), 0.0 (0.0-1.6; 0.7), 0.0 (0.0-1.6; 0.4), 0.5 (0.0-3.5; 1.9) and 0.0 (0.0-0.6; 0.5) [Table 1].
- Median duration of **CA** was 10.9 s (range: 4.0-25.3). Eleven children (22.9 %) had **prolonged CA** of >20 s, 9 children (18.8 %) had 1 or more **CA** followed by a **desaturation to $\leq 90\%$** . Only one child had no CA.
- OA** occurred in 10 children (20.8 %), with a median duration of 15.7 s (range: 7.6-40.6). None was associated with a desaturation to $\leq 90\%$.
- Eight children (16.6 %) had one or more **H** (median duration: 12.4 s; range: 4.1-19.7). None was associated with a desaturation to $\leq 90\%$.
- Two children presented one **MA** each, both associated with a desaturation by 5 %.
- Mean (SD; range) **CBPI** was 3.0 (1.7; 0.0 – 8.3).
- Snoring** occurred in 21 subjects (42%). 95th centile for PSP was 3.9 % (range: 0.0-11.4%). The one subject with a MOAHI > 1 did not snore at all. Snoring for more than 20 minutes was only recorded in two children; both had a MOAHI < 0.2 [Table 1].

CONCLUSION

- Isolated obstructive events (OA, MA and H) occurred in 18 children (37.5 %). 95th centile of MOAHI was 0.7, of OAI 0.4. Because both indices had no normal distribution curve, we would suggest to regard values above this threshold as abnormal [Fig. 1, Fig. 2].
- Both, isolated CA > 20 s and desaturations to $\leq 90\%$ occurred in these primary school children and should not be regarded as pathologic events as long as they do not occur frequently².
- Snoring for more than 20 minutes was rare and not associated with high MOAHI values.
- These data may serve as a basis for the interpretation of NHPSG recordings in children referred for OSAS.

MOAHI in healthy children

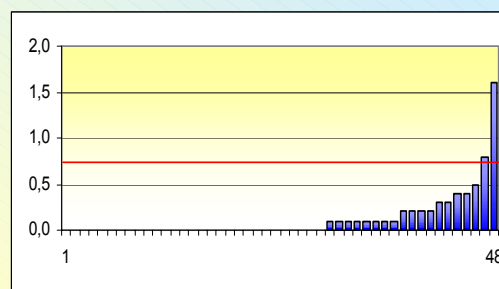


Fig. 1 — 95th centile of Mixed/Obstructive-Apnea-Hypopnea-Index in 48 healthy children

OAI in healthy children

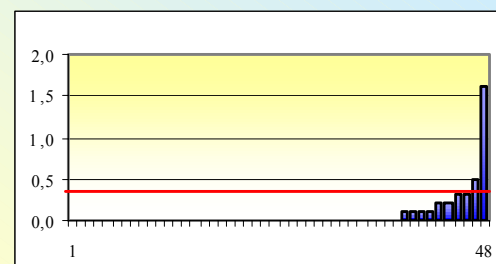


Fig. 2 — 95th centile of Obstructive-Apnea-Index in 48 healthy children

Polysomnographic values

	Mean \pm SD	Median	Range	25th Quartile	50th Quartile	75th Quartile	95th Centile	RRV *
AHI	1.9 \pm 1.2	1.7	0.0 - 5.8	1.1	1.7	2.5	4.9	4.3**
MOAHI	0.1 \pm 0.3	0.0	0.0 - 1.6	0.0	0.0	0.1	0.7	0.7***
OAI	0.1 \pm 0.3	0.0	0.0 - 1.6	0.0	0.0	0.0	0.4	0.4***
DI4	0.7 \pm 0.7	0.6	0.0 - 3.5	0.2	0.5	1.0	1.9	2.1**
DI90	0.0 \pm 0.1	0.0	0.0 - 0.6	0.0	0.0	0.0	0.5	0.5***

Table 1 Polysomnographic respiratory values of 48 healthy children

* RRV = Recommended reference values (according to the distribution of data, RRV are given as mean + 2 SD ** or 95th centile ***)

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
- American Thoracic Society: Standards and indications for cardiopulmonary sleep studies in children, Am J Respir Crit Care Med 1996;153:866-878