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The family role in children's sleep disturbances: Results from a cross-sectional study in a Portuguese Urban pediatric population ☆

Andreia Luís Martins[a,*], *Petra Chaves*[b], *Ana Luísa Papoila*[c], *Helena Cristina Loureiro*[a]

[a]*Hospital Professor Doutor Fernando Fonseca, Pediatric Department, IC 19, 2720-276 Amadora, Lisbon, Portugal*
[b]*Monte Abraão Primary Health Care Center, Av. da Liberdade, 36 and 37, 2745-300 Queluz, Sintra, Portugal*
[c]*CEAUL, NOVA Medical School, Universidade Nova de Lisboa, Campo Mártires da Pátria, 130, 1169-056 Lisbon, Portugal*

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ABSTRACT

Background: Sleep Disorders (SlD) are frequently undervalued complaints in childhood. Several factors influence sleep, particularly socio-cultural environment and medical conditions such as breathing disorders. Poor sleep hygiene has physical, educational and social consequences. In Portugal, there are few published studies about children's sleep habits and rarely based on validated questionnaires.

Aim: To study the prevalence of SlD and associated factors, in an outpatient pediatric population of a Primary Health Care Center (PHCC).

Methods: Cross-sectional study of children admitted to a PHCC on a suburban area of Lisbon. Children Sleep Habits Questionnaire, validated for the Portuguese population (CSHQ-PT) for the screening of SlD (cut-off=44), was applied to parents, as well as a demographic inquiry. Body mass index z-score was evaluated. Children scoring 44 or above were sent to Pediatric Sleep Disorders consultation (PSDC). Parametric and non-parametric tests were used whenever appropriate.

Results: From 128 children, 57.8% were male; the median age was 6.0 years (P_{25}=5.0; P_{75}=8.0). The median of cohabitants per family was 4.0 (P_{25}=3.0; P_{75}=5.0); 21.1% lived in a single-parent family. From CSHQ-PT, 59.4% (76) scored above the cut-off. Data showed that children from a single-parent family have more SlD (p=0.048), particularly parasomnia (p=0.019). Children with sleep disordered breathing (SDB) suffer more daytime sleepiness (p=0.034). From 63 children sent to PSDC, 33 attended. Regarding these children, a difference was found between BMI z-scores of those with and without SDB (p=0.06).

Abbreviations: SlD, Sleep Disorders; OSA, obstructive sleep apnea; CSHQ-PT, Portuguese Children Sleep Habits Questionnaire; PHCC, Primary Health Care Center; BTR, bedtime resistance; SOD, sleep onset delay; SDur, sleep duration; PS, parasomnia; NW, night awakenings; SA, sleep anxiety; SDB, sleep disordered breathing; DTS, daytime sleepiness; BMI, body mass index; PSG, polysomnography

☆This work was done in Monte Abraão Primary Health Care Center and Hospital Professor Doutor Fernando Fonseca, in the Pediatric Department.

*Corresponding author. Tel.: +351 214 348 287; fax: +351 214 348 292.
E-mail address: andreialuismartins@gmail.com (A.L. Martins).

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Conclusion: Family structure plays a non-negligible role in children's sleep habits. Daily performance of children with SDB may become compromised.

1. Introduction

Sleep is a vital physiological function and is known to be crucial to physical and mental health in children. Sleep Disorders (SlD) are among the most common complaints in childhood, often undervalued by clinicians. Large epidemiological studies have found that about 30% of children suffer from sleep problems [1–4].

Extrinsic and intrinsic factors influence sleep, particularly socio-cultural environment and some medical conditions such as breathing disorders [5,6]. Sleep disordered breathing (SDB) is increasingly recognized in children with primary snoring, upper airway resistance syndrome and obstructive sleep apnea (OSA). A combination of anatomic factors such as adenotonsillar hypertrophy and decreased oropharyngeal dimensions is involved in the development of SDB, as well as overweight and obesity in children [7]. Snoring is more common in adults than in children, although it is estimated that approximately 6–12% of children snore frequently and that between 1% and 3% of children suffer from obstructive sleep apnea hypoventilation syndrome [8,9]. SDB includes potentially severe complications for children such as neurobehavioural and cognitive, as well as the consequences in adulthood with an increased prevalence of metabolic syndrome with hypertension, obesity and insulin resistance [10,11].

It is recognized that poor sleep habits have physical, educational and social consequences [12]. As a result, it often interferes with daily life activities and family functioning. Family systems are dynamic, with reciprocal interactions that could have impact in child sleep, as well as child sleep problems can lead to family conflicts [13]. Not least important is the role of children's sleeping disorders in their mental health in adulthood [14].

The high prevalence of sleep problems, their negative implications for children and family and the success of educational interventions emphasize the need for early screening of Sleep Disorders [15]. Questionnaires are applied in clinical practice as recognized screening methods to evaluate sleep [16].

There are few Portuguese published studies about sleep habits in children and rarely based on validated questionnaires for the Portuguese population.

The primary aim of this study was to screen sleep habits and associated factors in an outpatient pediatric population of a Primary Health Care Center. In order to highlight children's sleep particularities in the studied population, a comparison of Children Sleep Habits Questionnaire validated for the Portuguese population (CSHQ-PT) subscales' scores with those of the CSHQ-PT questionnaire validation study, was also performed.

2. Material and methods

2.1. Subjects

A total of 136 children from 4 to 10 years old were admitted to a routine medical appointment at a Primary Health Care Center (PHCC) of a suburban area of Lisbon, from January to April 2013. All children, resident in the influence area of the referred PHCC, who attended a routine pediatric medical appointment in the referred period, were included. The exclusion criteria were: having less than 4 years old and more than 10 years and 364 days old; acute disease at the time of the medical appointment or in the previous week; the absence of authorization by parent or legal guardian and incomplete screening questionnaire. Since the aim was to screen sleep habits, children with chronic illness or comorbidities were not considered exclusion criteria in the present study.

The study was conducted in accordance with the principles of the Helsinki Declaration and was approved by the Clinical Council of the PHCC and National Committee for Data Protection. Informed consent was obtained from children's parents or a legal guardian.

2.2. Data

Children Sleep Habits Questionnaire validated for the Portuguese population (CSHQ-PT) [16] for the screening of SlD (Portuguese cut-off of total score = 44 points) was applied to parents or legal guardian. It comprises 8 subscales: bedtime resistance (BTR), sleep onset delay (SOD), sleep duration (SDur), parasomnia (PS), night awakenings (NW), sleep anxiety (SA), sleep disordered breathing (SDB) and daytime sleepiness (DTS). Each subscale was considered to be positive whenever a score higher than the mean of the subscales' scores of the CSHQ-PT questionnaire validation study was attained. An inquiry with demographic, health status and anthropometric information was also applied. Subjects were weighted on a calibrated scale to the nearest 100 g while wearing underwear and without shoes. Height was measured to the nearest 0.5 cm with a wall mounted stadiometer. Body Mass Index (BMI) z-score was determined by Center for Disease Control growth charts. Overweight was considered if BMI z-score was 2 or above.

2.3. Patient Referral

The criteria to any sleep disorder were met in children who scored 44 or above in CSHQ-PT. To those, a free specialized consultation of Pediatric Sleep Disorders (PSD) in the referral hospital was granted, in the following 3 months. Clinical

evaluation and management were performed according to the specific sleep disorder. For children who met criteria for SDB, polysomnography (PSG) was performed.

2.4. *Polysomnography*

PSG was performed in a single night spent in hospital with Alice 5 Respironics®. American Academy of Sleep Medicine (AASM) 2012 rules to score sleep were applied and performed by a single scorer with a MSC in Sleep Sciences [17]. All PSG were performed using electroencephalogram (frontal, central, and occipital channels), chin electromyogram, two leg channels, electro-oculogram, piezo-electric chest and abdominal belts, simultaneous pressure transducer and thermistor for nasal flow, transcutaneous (Tc) CO_2 and peripheral saturation (Sp) O_2 monitoring, snore microphone, electrocardiogram and simultaneous video monitoring.

2.5. *Statistical analysis*

An exploratory analysis was carried out for all variables. Categorical data was presented as frequencies and percentages, and continuous variables as mean or median, standard deviation (SD) or inter-quartile range (25th percentile-75th percentile) as required. Nonparametric Chi-square, Fisher's exact and Mann–Whitney tests were used. To compare CSHQ-PT subscales' scores' means with those of the CSHQ-PT questionnaire validation study, Z-test was performed and Bonferroni correction was applied to overcome multiple testing problems. A level of significance $\alpha=0.05$ was considered. All data were analyzed using the Statistical Package for the Social Sciences for Windows, version 22.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.)

3. Results

A total of 128 children were considered eligible (Fig. 1).

3.1. *Sample characterization*

The characterization of the sample is described in Table 1.

Mean duration of sleep in children was 9 h57 min (SD=1 h6 min). From CSHQ-PT, 59.4% ($n=76$) scored above the cut-off (≥ 44 points).

Comparing CSHQ-PT subscales means of the sample with those of CSHQ-PT questionnaire validation study [16], differences are found in BTR, SDur and PS (Table 2):

3.2. *Age, gender, culture and school performance in children's sleep hygiene*

No statistical difference was found for Sleep Disorders, regarding age, gender, ethnicity and school retention (Table 3). However, from the four children who experienced school retention, three had sleep disorder, according to CSHQ-PT.

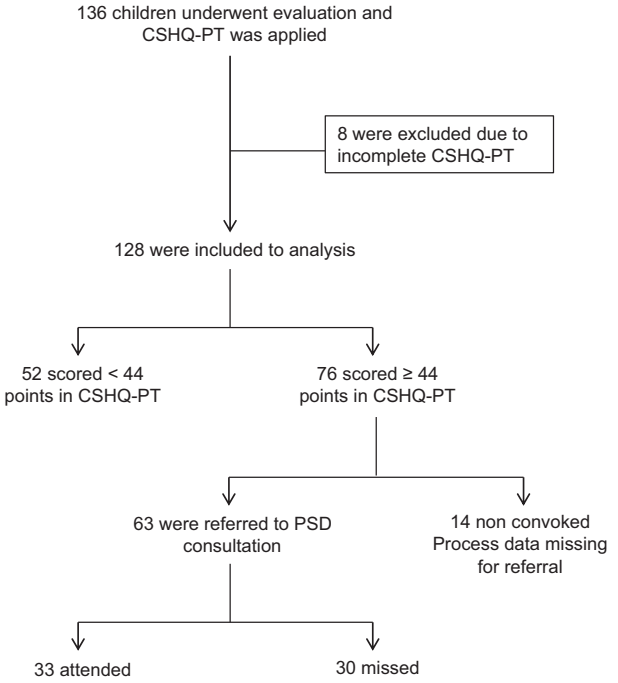

Fig. 1 – Study flow chart.

Table 1 – Study sample demographics ($n=128$).

Children demographics	
Male gender, *n* (%)	74 (57.8)
Age, years, median (P_{25}; P_{75})	6.0 (5.0; 8.0)
Ethnicity, *n* (%)	
Caucasian	93 (77.5)
African	20 (16.7)
Intercrossed	5 (4.2)
Asian	1 (0.8)
Hindu	1 (0.8)
BMI z-score, median (P_{25}; P_{75})	0.4 (−0.7;1.1)
Overweight, *n* (%)	10 (8.0)
School retention, *n* (%)	4 (3.2)
Family demographics	
Single-parent family, *n* (%)	26 (21.1)
Total of cohabitants, median (P_{25}; P_{75})	4.0 (3.0; 5.0)
Mother's age, median (P_{25}; P_{75})	37.0 (33.0; 39.3)
Father's age, median (P_{25}; P_{75})	38.5 (35.0; 42.0)
Parent's education, *n* (%)	
Mother-high school or less	97 (77.6)
Father–high school or less	104 (86.7)
Children comorbidities, *n* (%)	
Asthma	5 (4.0)
Allergic rhinitis	18 (14.3)
Atopic eczema	9 (7.1)
Tonsils hypertrophy	8 (6.3)
Developmental pathology	2 (1.6)

SD – Standard deviation.

3.3. *Family in children's sleep hygiene*

Data shows that children living in a single-parent family have more SlD ($p=0.048$), particularly parasomnia ($p=0.019$) (Table 4). Regarding sleep duration, children from

Table 2 – Comparison of CSHQ-PT subscale means in study sample and CSHQ-PT questionnaire validation study sample.

	Validation test Mean (SD)	Study sample Mean (SD)	p[a]
n	574	128	
BTR	7.59 (2.21)	8.91 (3.03)	**<0.001**
SOD	1.21 (0.49)	1.29 (0.58)	0.107
SDur	3.52 (0.98)	3.96 (1.33)	**<0.001**
PS	8.32 (1.59)	9.02 (1.66)	**<0.001**
NW	3.68 (1.10)	3.65 (1.23)	0.783
SA	5.42 (1.73)	5.69 (2.19)	0.129
SDB	3.37 (0.79)	3.59 (1.02)	0.007
DTS	13.41 (2.72)	13.09 (3.19)	0.244

An α=0.00625 was admitted, according to Bonferroni correction; BTR – bedtime resistance; SOD – sleep onset delay; SDur – sleep duration; PS – parasomnia; NW – night awakenings; SA – sleep anxiety; SDB – sleep disordered breathing; DTS – daytime sleepiness.
[a] Z-test.

Table 3 – Association between SlD and age, gender, ethnic origin and school retention.

	SlD	No SlD	p
Age, median (P_{25}; P_{75})	6.0 (4.0; 8.0)	6.5 (4.0; 8.5)	0.183[§]
Male gender, n (%)	48 (63.2)	26 (50.0)	0.139[§§]
Ethnic origin			0.652[§§§]
Caucasian, n (%)	54 (75.0)	39 (81.3)	
African origin, n (%)	14 (19.4)	6 (12.5)	
Others, n (%)	4 (5.6)	3 (42.9)	
School retention, n (%)	3 (4.0)	1 (2.0)	0.649[§§§]

SlD – Sleep Disorder
[§] Mann–Whitney test p-value.
[§§] Chi-square test p-value
[§§§] Fisher's exact test p-value.

monoparental families sleep less than nuclear ones, however no statistical significance was found (mean 9 h42 m versus 10 h02 m, p=0.191)

3.4. *Sleep Disordered breathing, day time sleepiness and children's weight*

Children with SDB show more DTS (p=0.034). No statistical difference is found in BMI z-score neither overweight (Table 5).

3.5. *Analysis of patients referred to specialized consultation of Pediatric Sleep Disorders*

From those who presented criteria for SlD, 63 were referred and only 33 attended the PSD consultation.

The following table characterizes referred children (Table 6).

Regarding CSHQ-PT score and type of family, among children who attended and those who missed it, no difference was found (Table 7).

Table 4 – Association between SlD, PS, SA and BTR scores and type of family.

	Single parent n=26	Two parents n=92	p
Children with SlD; n (%)	20(76.9)	51(55.4)	**0.048**[§§]
PS scores, median (P_{25}; P_{75})	10.0(8.0;11.0)	9.0(7.0;10.0)	**0.019**[§]
SA scores, median (P_{25}; P_{75})	6.0(5.0; 8.0)	5.5(4.0; 8.0)	0.266[§]
BTR scores, median (P_{25}; P_{75})	8.0(7.0; 11.0)	8.0(6.0; 11.0)	0.995[§]

SlD – Sleep Disorder (total score ≥ 44); PS – parasomnia; SA - sleep anxiety; BTR – bed time resistance
[§] Mann–Whitney test p-value.
[§§] Chi-square test p-value.

Table 5 – Association between SDB and DTS, BMI z-score and overweight.

	SDB n=19	Non SDB n=109	p
Children with DTS, n (%)	13(68.4)	46(42.2)	**0.034**[§§]
BMI z-score, median (P_{25}; P_{75})	1.0(−0.2; 1.3)	0.3(−0.7; 1.0)	0.173[§]
Overweight, n (%)	2(11.1)	8(7.5)	0.636[§§§]

SDB – sleep disordered breathing; DTS – daytime sleepiness; BMI – body mass index; SDB was considered if scored above 1 standard deviation of SDB obtained from the CSHQ-PT questionnaire validation study [16].
[§] Mann–Whitney test p-value.
[§§] Chi-square test p-value.
[§§§] Fisher's exact test p-value.

Table 6 – Characterization of children referred to Pediatric Sleep Disorders consultation.

CSHQ-PT score, median (P_{25}; P_{75})	52.0 (46.0; 56.0)
Child demographics	
Male gender, n (%)	39 (61.9)
Age, years, median (P_{25}; P_{75})	6.0 (4.0; 8.0)
BMI z-score, median (P_{25}; P_{75})	0.65 (-0.7; 1.3)
Overweight, n (%)	(9.7)
Family demographics	
Single-parent family, n (%)	(32.8)
Total of cohabitants, median (min; max)	4 (2; 6)

SD – Standard deviation.

3.5.1. *Study of children who attended Pediatric Sleep Disorders consultation*

From those who attended the appointment, a median of 5 altered subscales was found in each child (minimum: 3; maximum: 8). The graphic below shows the number of children with high score for each subscale (Fig. 2).

Regarding children with SDB, there was a tendency for higher BMI z-score (Table 8).

3.5.1.1. *Polysomnography*. PSG was performed in 11 children (Table 9). In 8 of them, the exam was performed due to their high score in SDB subscale. For patients 3 and 6, although not presenting high score for SDB, clinical symptoms suggestive of OSA were found on consultation. However, for patient 6, OSA

Table 7 – Association between Pediatric Sleep Disorders consultation attendance and CSHQ-PT score and type of family.

	Attended $n=33$	Missed $n=30$	p
CSHQ-PT score, median (P_{25}; P_{75})	53.0 (47.5; 57.5)	50.5 (45.8; 55.0)	0.114§
Two-parent family, n (%)	20 (48.8)	21 (51.2)	0.648§§

§ Mann–Whitney test p-value.
§§ Chi-square test p-value.

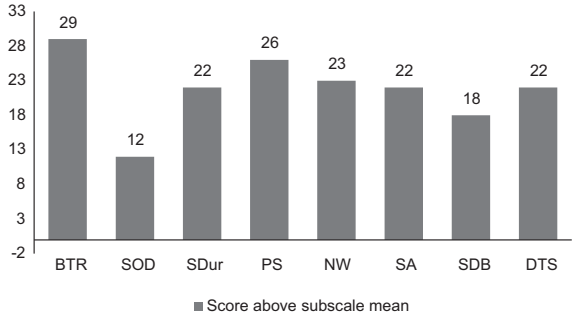

Fig. 2 – Number of children who attended to the Pediatric Sleep Disorders consultation and scored above for each mean sleep subscale [16]. BTR – bedtime resistance; SOD – sleep onset delay; SDur – sleep duration; PS – parasomnia; NW – night awakenings; SA – sleep anxiety; SDB – sleep disordered breathing; DTS – daytime sleepiness.

Table 8 – Association between SDB and BMI z-score in children who attended the appointment.

	SDB $n=18$	Non SDB $n=15$	p
BMI z-score, median (P_{25}; P_{75})	0.8 (−0.2; 1.4)	0.1 (−1.4; 0.8)	**0.06**§

SDB – Sleep disordered breathing.
§ Mann–Whitney test p-value.

was not confirmed in polysomnography. Patients 10 and 11 had developmental disorders as comorbidity (attention deficit and hyperactivity disorder and Asperger syndrome, respectively).

From children submitted to the exam, 72.7% were male, the median age was 5 years ($P_{25}=4$; $P_{75}=7$), and presented a median BMI z-score of 0.8 ($P_{25}=-0.7$; $P_{75}=2.4$). The median score of CSHQ-PT was 55 ($P_{25}=52$; $P_{75}=59$). From the PSG analysis, 70.0% had an increased latency and 54.5% had decreased efficiency. 81.8% of the children had an increased Slow Wave Sleep and 90.9% had a decreased rapid eye movement (REM) sleep. Still in this sub sample, OSA (apnea/hypopnea index-AHI > 1/h) was identified in 90.9% with a case of severe OSA with an AHI 24.6 per hour.

4. Discussion

The prevalence of SlD found (59.4%) was higher than reported in the medical literature [1–4]. A possible explanation may be related with low parents' education. Subscales associated with behavioral SlD were the most relevant in this sample, fact explained by the capability of CSHQ-PT on the evaluation of this kind of disturbances.

The study suggests that family structure influences children's sleep habits, to our knowledge not reported in the literature. Single parent families, with a high prevalence in our society (21.1% of our sample), may adopt different routines for children and hence, influence their sleep routines. The authors propose early intervention on parental education regarding sleep hygiene in those families, in order to overcome this issue.

The higher scores in bedtime resistance and parasomnias, obtained by the CSHQ-PT subscales of this study, when compared to those of CSHQ-PT validation study, are probably due to the type of families involved. In fact, children living in a single parent family had more sleep disturbances ($p=0.048$), especially parasomnias ($p=0.019$). The fact of co-sleeping being more practiced in monoparental families brings more awareness of parents for perceiving sleep disturbances.

In our study, a statistical significance in sleep related anxiety was not found, since co-sleeping may act as a modulator of sleep anxiety.

In what concerns to SDB, children had more daytime sleepiness ($p=0.034$). According to the literature, SDB should also influence school performance [18]; however this was not found in this study. This lack of association was probably due to the sample size. The low rate of school retention (3.2%) may have led to an underestimation of the association between children's school performance and Sleep Disorders in general, and SBD in particular. The same happened regarding overweight (8.0%).

An early identification and management of ENT disorders is advisable, as well as approaches towards adequate nutritional status, in order to obtain healthy sleep habits and therefore a better performance in children's daily life activities.

Another interesting point of this study is the low attendance (52.4%) to the PSD outpatient clinic. This highlights further need to call parents' attention for children Sleep Disorders, frequently misunderstood as children's "normal behavior".

Analyzing the sub-sample corresponding to the 33 children who went to PSD, 32.8% came from a single parent family and had a similar CSHQ-PT score regarding children that missed the appointment. Concerning CSHQ-PT, a median of 5 altered subscales was found. The most prevalent were BTR, (29/33); PS (26/33) and NW (23/33). There is an evidence that children identified with SDB had a higher BMI z-score ($p=0.06$). From these 33 children, 11 (33.3%) were admitted to perform a PSG, mostly due to clinical identification of SDB. This exam allowed confirmation of OSA in 90.9% of the children, including one severe case. However, despite the clinical symptoms of OSA, one child presented a normal AHI, highlighting the importance of performing a PSG. It is worth noting that 70% of children presented increased latency, probably due to anxiety related to PSG; the decreased REM sleep in almost all of them was probably related to OSA. In one patient a reduction of REM in spite of having a normal AHI could be related to another factor, such as anxiety.

Table 9 – Characterization of children submitted to polysomnography and corresponding results.

Pt	Gd	Age	BMI z-score	CSHQ-PT score	BTR	SOD	SDur	PS	NW	SA	SDB	DTS	Polysomnography					
													Latency	Efficiency	N3	REM	AHI	PS
													(RV <30 min)	(VR >85% TST)	(RV 15–20% TST)	(RV >20% TST)	(RV <1/h)	
1	M	5	3.4	52	Y	N	Y	Y	N	Y	Y	Y	25.0	90.3	24.8	13.3	**3.1**	N
2	F	4	−0.7	46	Y	N	Y	Y	N	N	Y	Y	64.0	79.0	22.7	17.2	**3.1**	N
3	M	6	−6.2	54	Y	N	N	Y	Y	N	N	Y	23.0	81.5	21.9	13.9	**1.6**	Y
4	M	4	0.8	55	Y	Y	Y	Y	Y	Y	Y	Y	65.0	84.1	17.5	17.2	**2.6**	N
5	F	7	−0.7	71	Y	N	Y	Y	Y	Y	Y	Y	70.0	74.1	18.0	23.8	1.2	N
6	M	9	2.6	52	Y	Y	Y	Y	Y	Y	N	N	60.0	79.8	25.0	10.3	0.7	N
7	M	10	1.0	60	Y	Y	Y	Y	Y	Y	Y	N	61.0	66.6	26.9	7.7	**24.6**	N
8	M	4	1.3	57	Y	Y	Y	Y	Y	N	Y	Y	0.0	96.6	24.6	17.0	**3.7**	Y
9	M	5	0.0	59	Y	N	Y	Y	Y	Y	Y	Y	40.0	92.5	22.7	10.8	**1.7**	N
10	M	5	−1.4	56	Y	N	Y	Y	N	Y	N	Y	26.0	89.7	21.9	19.2	**1.8**	Y
11	M	4	2.4	50	Y	N	N	Y	Y	Y	Y	N	50.0	91.6	24.5	16.7	**2.9**	N

Pt – patient; Gd – gender; BTR – bedtime resistance; SOD – sleep onset delay; SDur – sleep duration; PS – parasomnia; NW – night awakenings; SA – sleep anxiety; SDB – sleep disordered breathing; DTS – daytime sleepiness; TST – total sleep time; REM – rapid eye movement; AHI – apnea/hypopnea index; RV – reference value; Y – yes; N – no.

A methodical approach of sleep hygiene in routine pediatric outpatient by general practitioners and pediatricians is crucial to a better management of Sleep Disorders. As a matter of fact, a screening questionnaire will elucidate their nature and severity and, whenever appropriate, lead to the referral of a Pediatric Sleep Disorder consultation, fact that we consider people are not sensitized to.

This was the first descriptive study performed in Portugal on a healthy pediatric population of this age group, applying an international questionnaire validated for Portuguese children. Further studies are needed for a better understanding of factors and consequences of poor sleep habits, in order to provide a more accurate intervention.

The possible lack of representativeness of this sample and its reduced size should be considered limitations of this study. The low school retention found may be related with the evaluation procedure in primary school that recommends that children should not be retained in the first years. Therefore, we probably should have evaluated children's grades in order to better understand the impact of sleep in this issue. Moreover, families should have been better characterized, in terms of family environment, family structure, employment status and family institutional support, in order to understand the impact of single parent families on sleep hygiene rules.

5. Conclusion

Family structure plays a non-negligible role in children's sleep habits. Health care providers are crucial in the management of the causes and consequences of sleep problems among children and in the evaluation of impact in the entire family system. Since Sleep Disorders are recognizable and treatable, the results from this study suggest significant need for additional education and support for primary care and pediatrics providers in the screening, diagnosis and treatment of Sleep Disorders.

Disclosures

The authors declare that they have no competing interests.

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