Sleep characteristics in Brazilian children and adolescents: a population-based study

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A B S T R A C T

Objective/background: To evaluate sleep characteristics in Brazilian children and adolescents aged 0—19 years and determine the prevalence of sleep disturbances (SDs) and their association with regional differences and socioeconomic status (SES).
Patients/methods: The target population was divided into three age groups: 0—3 years, 4—12 years, and 13—19 years. An online questionnaire based on Brazilian versions of instruments for sleep assessment was made available to participants from 2014 to 2017. Sleep habits were characterized following the recommendations of the instruments and of the National Sleep Foundation. Data were evaluated by bivariate analyses and logistic regression analyses ($p \leq 0.05$).
Results: A total of 1180 respondents were included, representative of all Brazilian regions and SES levels. Inadequate bedtime habits and total sleep time below the recommended levels were observed in all age groups. Overall SD prevalence was 25.5%. Increased risk of SDs was associated with a current health problem in children aged 0—3 years, with hospitalization after birth and sleeping in parents' bed in children aged 4—12 years, and with medication use and playing video games/using the cell phone before sleep in adolescents. There was no significant difference in SD rates between the regions. There was an increased risk of SDs in children with low SES (0—3 years), lower middle SES (4—12 years), and high SES (13—19 years).
Conclusions: Brazilian children and adolescents overall present inadequate sleep habits and sleep duration lower than recommended. SDs increased with age, reaching a peak in adolescence, with an influence of SES on these disturbances.

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1. Introduction

Brazil is a country of continental dimensions with a population of more than 207 million people [1], of whom approximately 30 million (14.6%) are children (aged 0—9 years) and 35 million (17.2%) are adolescents (aged 10—19 years) [2]. Brazilian socioeconomic inequality and multiculturalism across the country are known to interfere with several aspects of human development and the general health of the population [3].

Sleep disturbances (SDs) are common during childhood and adolescence, with worldwide prevalence rates ranging from 20 to 40% [4,5]. In Brazil, existing prevalence rates relate to specific disorders [6—9]; however, the overall prevalence rate of SDs in Brazilian children and adolescents remains unknown.

SDs are associated with behavioral, environmental, and social factors and are often underdiagnosed, although their recognition is important for proper clinical management [4,10]. Questionnaires are considered a reliable tool for sleep assessment and have demonstrated associations with SDs, because a child's bedtime routine is largely observational and parents/caregivers are the primary sources of information [4].

The aims of this study were to describe the sleep characteristics of Brazilian children and adolescents aged 0—19 years, examine the approach to sleep during routine outpatient visits with a pediatrician, and determine the prevalence of SDs and their association with perinatal factors, regional differences, and socioeconomic status (SES).

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2. Patients and methods

This was a contemporary, exploratory, population-based, cross-sectional study with data collected through a web-based digital data acquisition system made available to participants from March 2014 to July 2017. The survey population consisted of children and adolescents born in Brazil, divided into three age groups: from 0 to 3 years and 11 months, from 4 to 12 years and 11 months, and adolescents from 13 to 19 years and 11 months, according to the instruments (questionnaires and scales) used in the research.

Sample size calculation was based on the number of Brazilians aged 0–19 years per region of the country and SES in order to obtain statistical proportionality for data analysis. Assuming a margin of error of 2.48 according to estimated survey response, a sample size of 1180 participants was necessary to cover all five regions of Brazil (North, Northeast, Midwest, Southeast, and South) [1] and all five Brazilian SES levels (low, lower middle, middle, upper middle, and high) based on family income [3]. These data were investigated proportionally and treated at the end of data collection to satisfy the proportionality condition. To contemplate this proportion, some questionnaires were collected face-to-face in some regions with greater difficulty in accessing the computer and internet.

Eligible participants were all children and adolescents within the predetermined age groups. Written informed consent was obtained from the parents or legal guardians for enrollment in the study, while informed assent was obtained from the children/adolescents. Incomplete questionnaires and questionnaires with inconsistent responses were excluded. The survey was applied using Qualtrics® online survey software (www.qualtrics.com/). All selected instruments [11–14] were suitable for assessment of the age groups under study, could be completed by the parents/caregivers, followed international guidelines, provided a categorization of SDs, and had been validated for use in Brazil at the time the data collection began.

After approval by the institutional review board, strategies for application of the instruments began to be implemented. Parents of participants were recruited by health-provider referral, newspaper/magazine reports and advertisements on social media platforms, and availability of the link to the online survey in research institutes, health fairs, institutions providing care to the target population, and websites addressing the topic of research in order to increase survey visibility and hence data collection. Subjects aged over 18 years were allowed to answer questionnaires on their own.

From August to October 2013, a pilot study of 150 respondents was conducted to validate the questionnaires, including contact with the researchers via social media to address inconsistencies and comprehension problems. Adjustments and modifications were implemented to improve technical aspects and layout, resulting in the final version of the survey questionnaire.

Upon clicking on the link to the survey (http://j.mp/1sK1qzE), respondents were directed to the informed consent to indicate their consent to participate in the study, which was required for the next step. After consent, respondents were asked to indicate the participant's age group, biopsychosocial data (perinatal data, health status, schooling), questions about telling the doctor about sleep problems (does your son/daughter's doctor ever ask in a routine visit about your children sleep? Have you ever asked/commented to your children's doctor regarding doubts or complaints about sleep?), questions about sleep routines (Identify whether your children have specific habits before sleep: None/Yes – options: watches TV, uses pacifier, sucks finger, uses toys or transitional objects; Inform whether your son/daughter regularly uses any of the following devices before sleep: None/Yes – options: TV, electronic games, computer, portable phone, device for listening to music, paper book) and SES as determined by family income [2].

Then they were immediately directed to one of the following questionnaires: children aged 0–3 years and 11 months – the validated Brazilian version [11] of the Brief Infant Sleep Questionnaire (BISQ) [15]; children aged 4–12 years and 11 months – the validated Brazilian version [12] of the Sleep Disturbance Scale for Children (SDSC) [16]; and adolescents aged 13–19 years and 11 months – the validated Brazilian version [13] of the Epworth Sleepiness Scale (ESS) [17] and the validated Brazilian version [14] of the Pittsburgh Sleep Quality Index (PSQI) [18]. Upon completion of the questionnaire(s), respondents were debriefed and thanked for their participation.

SDs were determined following the original criteria suggested by the authors of the different scales used. Sleep duration criteria were assessed following the recommendations of the National Sleep Foundation.

Categorical variables were expressed as frequencies and percentages, while continuous variables were expressed as mean (standard deviation) and minimum and maximum values. Bivariate analyses were performed by simple logistic regression and used in the multiple logistic regression model (Wald test). Variables with a p-value ≥ 0.150 were removed from the model by backward elimination and compared by the likelihood ratio test. Possible interactions between the variables and potential confounding factors were investigated (coefficients greater than 15%). Data were analyzed using SPSS, version 11.0 for Windows. The level of significance was set at $p \leq 0.05$.

3. Results

A total of 1180 individuals participated in the study. Of these, 350 were in the 0–3 years age group (184 boys), 450 in the 4–12 years age group (242 boys), and 380 in the 13–19 years age group (180 boys). Sex distribution was homogeneous among the three age groups (48.6% female and 51.4% male). Table 1 shows the general characteristics of the sample.

3.1. Overall sleep characteristics, sleep duration, and prevalence of SDs

The overall sleep characteristics of the study population are shown in Table 2.

In the 0–3 years age group, co-sleeping and sleep position, because they are well-known risk factors for sudden infant death syndrome, were divided into two age subgroups for analysis: 0–12 months and 1–3 years. Among infants aged 0–12 months, the rate of co-sleeping was 38.8% and of inadequate sleep position (prone or side) was 68.8%. Inadequate bedtime habits were observed among children aged 0–3 years, such as watching television (10.9%). Most (78.0%) parents/caregivers did not consider the child's sleep a problem, so that only 8.6% always asked the pediatrician about the child's sleep during routine visits. As for pediatricians, only 15.1% of them always asked the parents/caregivers about the child's sleep and 33.2% never asked.

In the 4–12 years age group, 47.1% of parents/caregivers reported that the child occasionally slept in their bed, and 64.8% of children had inadequate bedtime habits, such as watching television (25.6%). Only 6% of parents/caregivers always asked the pediatrician about the child's sleep during routine visits, and 10% of pediatricians asked the parents/caregivers. In the 13–19 years age group, most adolescents had poor bedtime habits such as watching television (69.7%), using the computer (61.1%), using the cell phone (50.5%), and playing video games (49.7%).

Table 3 shows the data on sleep latency and duration. In all age groups, mean sleep duration was below or within the low end of the range of values recommended by the National Sleep

Table 1
General characteristics of the sample aged 0−19 years (N = 1180).

Variables	Age group		
	0−3 years (N = 350)	4−12 years (N = 450)	13−19 years (N = 380)
Sex, N (%)			
Male	184 (52.6)	242 (53.8)	172 (45.3)
Female	166 (47.4)	208 (46.2)	208 (54.7)
Schooling			
No Schooling	170 (48.6)	8 (1.8)	−
Pre-school	180 (51.4)	123 (27.3)	44 (11.6)
Incomplete elementary school	−	156 (34.7)	44 (11.6)
Complete elementary school	−	98 (21.8)	139 (36.6)
Incomplete middle school	−	30 (6.7)	65 (17.1)
Complete middle school		35 (7.8)	88 (23.2)
High school		−	
Delivery data, N (%)			
Mode of delivery, N (%)			
Vaginal delivery	105 (30)	352 (78.2)	NA
Cesarean section	245 (70)	98 (21.8)	NA
Complications, N (%)			
No	283 (80.9)	364 (80.9)	NA
Yes	67 (19.1)	86 (19.1)	NA
Hospitalization, N (%)			
No	311 (88.9)	372 (82.7)	NA
Yes	39 (11.1)	78 (17.3)	NA
Birth data			
Weight (g)			
Mean (SD)	3249 (463)	3235 (542)	NA
Min−max	1370−4360	900−5110	NA
Length (cm)			
Mean (SD)	48.6 (2.7)	48.4 (2.8)	NA
Min−max	30−56	34−55	NA
Gestational age (weeks)			
Mean (SD)	38.5 (2.0)	38.4 (2.2)	NA
Min−max	25−42	24−44	NA
Developmental data, N (%)			
Considers development			
Normal	341 (97.4)	421 (93.6)	NA
Abnormal	9 (2.6)	29 (6.4)	NA
Health problems, N (%)			
No	286 (81.7)	326 (72.4)	336 (88.4)
Yes	64 (18.3)	124 (27.6)	44 (11.6)
Medication use, N (%)			
No	274 (78.3)	369 (82.0)	318 (83.7)
Yes	76 (21.7)	81 (18.0)	62 (16.3)
Family data, N (%)			
Marital status			
Living together	316 (90.3)	100 (22.2)	254 (66.8)
Living separately	34 (9.7)	350 (77.8)	126 (33.2)
Socioeconomic status, N (%)			
High	49 (14.0)	82 (18.2)	70 (18.4)
Upper middle	67 (19.1)	104 (23.1)	48 (12.6)
Middle	80 (22.9)	96 (21.3)	64 (16.8)
Lower middle	74 (21.1)	86 (19.1)	89 (23.4)
Low	80 (22.9)	82 (18.2)	109 (28.7)

Min−max, minimum and maximum values; NA, not asked; SD, standard deviation.

Foundation. On average, adolescents went to bed at about 23:20 h, with mean latency to falling asleep of 34 min.

The SD rates in the study population are shown in Table 4. The overall prevalence of SDs was 25.5% (301/1180), with a prevalence rate of 20.0% (70/350) in children aged 0−3 years, 23.0% (104/450) in children aged 4−12 years, and 33.4% (127/380) in adolescents aged 13−19 years.

In children aged 0−3 years, SDs were due to nocturnal wakefulness >1 h (11.4%), more than three nocturnal awakenings (8.0%), and total sleep time <9 h (6.6%). In children aged 4−12 years, SDs were attributable primarily to disorders of initiating and maintaining sleep (22.7%), followed by sleep−wake transition disorders (18.4%), sleep breathing disorders (17.1%), disorders of arousal (10.4%), excessive daytime sleepiness (9.3%), and sleep hyperhidrosis (9.1%). In adolescents aged 13−19 years, 52.9% had mild and 27.9% had excessive daytime sleepiness (Table 4).

3.2. Risk factors associated with SDs

The variables associated with SDs are shown in Table 5.

In children aged 0−3 years, having a current health problem (odds ratio (OR): 3.72 (1.43−9.66); $p < 0.01$) and having the child's sleep considered a problem by the parents/caregivers (OR: 9.83 (4.74−20.41); $p < 0.01$) significantly increased the risk of SDs.

In children aged 4−12 years, the variables associated with an increased risk of SDs were hospitalization after birth (OR: 1.86 (1.03−3.37); $p < 0.05$), sleeping in parents' bed (OR: 2.46 (1.27−4.79); $p < 0.01$), and parents asking the pediatrician about the child's sleep during routine visits (OR: 2.28 (1.26−4.12); $p < 0.01$).

In adolescents aged 13−19 years, medication use (OR: 2.94 (1.48−5.84); $p < 0.01$) and playing video games (OR: 1.28 (1.14−1.54); $p < 0.01$) and using the cell phone (OR: 1.49 (0.88−2.53); $p < 0.05$) before sleep significantly increased the risk of SDs.

Table 2
Overall sleep characteristics in Brazilian children and adolescents.

Variable	N (%)
0−3 years of age (N = 350)	
Sleeping arrangement	
Crib/bed in a separate room	175 (50.0)
Crib/bed in parents' room	96 (27.4)
In parents' bed (co-sleeping)	79 (22.6)
Sleep position	
On the child's back	117 (33.4)
On the child's side	154 (44.0)
On the child's belly	79 (22.6)
Method of falling sleep	
While feeding	76 (21.7)
Being rocked	38 (10.9)
Being held	42 (12.0)
In crib/bed alone	94 (26.9)
In parents' bed	100 (28.6)
The child's sleep is considered a problem by the parents/caregivers	
Yes	77 (22.0)
No	273 (78.0)
Bedtime habits[a]	
Watching TV	38 (10.9)
Pacifier use/thumb-sucking	114 (32.6)
Holding a teddy bear/blanket	37 (10.6)
Other (breast or bottle feeding, songs)	81 (23.1)
None	80 (22.8)
Pediatrician asks about the child's sleep during routine visits (as reported by the parents/caregivers)	
Never	116 (33.1)
Occasionally	130 (37.1)
Often	51 (14.6)
Always	53 (15.1)
Parents/caregivers ask about the child's sleep during routine visits	
Never	110 (31.4)
Occasionally	155 (44.3)
Often	55 (15.7)
Always	30 (8.6)
4−12 years of age (N = 450)	
Sleeps in parents' bed	
Never	128 (28.5)
Occasionally	212 (47.1)
Often	61 (13.6)
Always	49 (10.9)
Bedtime habits[a]	
Watching TV	115 (25.6)
Pacifier use/thumb-sucking	22 (4.9)
Holding a teddy bear/blanket	57 (12.7)
Other (reading, songs)	97 (21.6)
None	159 (35.3)
Pediatrician asks about the child's sleep during routine visits (as reported by the parents/caregivers)	
Never	130 (28.9)
Occasionally	218 (48.4)
Often	57 (12.7)
Always	45 (10.0)
Parents/caregivers ask about the child's sleep during routine visits	
Never	177 (39.4)
Occasionally	190 (42.2)
Often	56 (12.4)
Always	27 (6.0)
13−19 years of age (N = 380)	
Bedtime habits[a]	
Watching TV	265 (69.7)
Using the computer	232 (61.1)
Using the cell phone	192 (50.5)
Playing video games	189 (49.7)
Listening to music	222 (58.4)
Reading	227 (59.7)

[a] Multiple answers allowed.

Table 3
Characteristics related to nocturnal sleep duration and sleep latency.

Variable		
0−3 years of age (N = 350)	Nocturnal sleep duration[a] % (N)	Sleep latency[b] % (N)
Recommended	93.4% (327)	77.4% (271)
Not recommended	6.6% (23)	22.6% (79)
4−12 years of age (N = 450)	Nocturnal sleep duration[a] % (N)	Sleep latency[b] % (N)
Recommended	95% (427)	78.2% (352)
Not recommended	5% (22)	21.8% (98)
13−19 years of age (N = 380)	Nocturnal sleep duration[a] % (N)	Sleep latency[b] % (N)
Recommended	89.2% (339)	65.3% (248)
Not recommended	10.8% (41)	34.7% (132)

[a] 0−3 years: recommended (>9 h), not recommended (<9 h); 4−12 years: recommended (>7 h), not recommended (<7 h); 13−19 years: recommended (>6 h), not recommended (<6 h).
[b] For all ages: recommended (<30 min), not recommended (>30 min).

3.3. Regional characteristics and SDs

SD prevalence rates in the different regions of the country are shown in Table 6. Higher SD rates in children aged 0−3 years were observed in the Southeast (26.1%), in children aged 4−12 years in the Northeast (36.2%), and in adolescents aged 13−19 years in the Midwest (44.7%). However, there was no statistically significant difference between the regions in any of the age groups.

3.4. SES and SDs

The associations between SDs and SES are shown in Table 7. There was an increased risk of SDs in children aged 0−3 years with

Table 4
Prevalence of sleep disturbances.

Variable	N (%)
0−3 years of age (N = 350)	
Abnormal BISQ	70 (20.0)
More than 3 nocturnal awakenings	28 (8.0)
Nocturnal wakefulness >1 h	40 (11.4)
Total sleep time <9 h	23 (6.6)
4−12 years of age (N = 450)	
Abnormal SDSC	104 (23.0)
Disorders of initiating and maintaining sleep	102 (22.7)
Sleep breathing disorders	77 (17.1)
Disorders of arousal	47 (10.4)
Sleep−wake transition disorders	83 (18.4)
Excessive daytime sleepiness	42 (9.3)
Sleep hyperhidrosis	41 (9.1)
13−19 years of age (N = 380)	
Abnormal ESS	106 (27.9)
Mild daytime sleepiness	201 (52.9)
Excessive daytime sleepiness	106 (27.9)
Abnormal PSQI	33 (8.7)
Poor sleep quality	82 (21.6)
Poor sleep latency	132 (34.7)
Poor sleep duration	41 (10.8)
Poor sleep efficiency	26 (6.8)
Difficulty falling asleep	70 (18.4)
Use of sleeping medication	10 (2.6)
Daytime dysfunction	113 (29.7)
Total sleep disturbances: adolescents	127 (33.4)
Total sleep disturbances: total sample	300 (25.5)

BISQ, Brief Infant Sleep Questionnaire; ESS, Epworth Sleepiness Scale; PSQI, Pittsburgh Sleep Quality Index; SDSC, Sleep Disturbance Scale for Children.

Table 5
Variables associated with sleep disturbances.

Variable	Crude OR[a] (95% CI)	p	Adjusted OR[b] (95% CI)	p
0–3 years of age (N = 350)				
Gestational age (<37 weeks)	1.83 (0.95–3.51)	0.06	2.15 (0.93–4.93)	0.07
Current health problem	1.60 (0.77–3.30)	0.20	**3.72 (1.43–9.66)**	**0.00**
The child's sleep is considered a problem by the parents/caregivers	6.17 (3.47–10.95)	0.00	**9.83 (4.74–20.41)**	**0.00**
4–12 years of age (N = 450)				
Hospitalization after birth	2.18 (1.28–3.69)	0.00	**1.86 (1.03–3.37)**	**0.03**
Sleeps in parents' bed	2.63 (1.47–4.69)	0.00	**2.46 (1.27–4.79)**	**0.00**
Parents/caregivers ask the pediatrician about the child's sleep	2.09 (1.24–3.50)	0.00	**2.28 (1.26–4.12)**	**0.00**
Inadequate sleep habits	1.65 (1.01–2.68)	0.04	1.56 (0.90–2.72)	0.11
13–19 years of age (N = 380)				
Current health problem	1.41 (0.85–2.32)	0.17	1.74 (0.95–3.19)	0.07
Medication use	2.31 (1.33–4.01)	0.00	**2.94 (1.48–5.84)**	**0.00**
Bedtime habits				
Watching TV	1.26 (0.96–1.65)	0.09	1.54 (0.80–2.96)	0.19
Reading	1.07 (0.79–1.45)	0.13	1.08 (0.60–1.95)	0.19
Listening to music	0.91 (0.70–1.18)	0.15	1.12 (0.61–2.06)	0.17
Playing video games	1.59 (1.23–2.07)	0.00	**1.28 (1.14–1.54)**	**0.00**
Using the computer	1.03 (0.79–1.34)	0.28	1.42 (0.75–2.68)	0.18
Using the cell phone	0.74 (0.58–0.96)	0.02	**1.49 (0.88–2.53)**	**0.03**

CI, confidence interval; OR, odds ratio.
Bold numbers are the ones with statistical significance.
[a] Obtained by bivariate logistic regression.
[b] Obtained by multivariate logistic regression (Wald test; $p \leq 0.05$).

low SES (OR: 3.07 (0.80–11.78); $p < 0.05$), in children aged 4–12 years with lower middle SES (OR: 5.36 (1.84–15.62); $p < 0.01$), and in adolescents aged 13–19 years with high SES (OR: 3.81 (1.64–8.85); $p < 0.01$).

4. Discussion

The present study demonstrated that Brazilian children are exposed to inadequate bedtime habits in all age groups, with total nocturnal sleep time below the recommended levels. There is also little concern about the child's sleep in routine medical visits, with a 25% prevalence rate of SDs and association with SES (low SES in children up to 12 years of age and high SES in adolescents were

associated with poor sleep). There were no regional differences in the occurrence of SDs in Brazil, although higher rates were found in the Southeast (0–3 years), Northeast (4–12 years), and Midwest (13–19 years).

The inadequate sleep habits observed in the 0–12 months age subgroup, such as high rates of co-sleeping and risky sleep position, have already been reported in previous studies conducted in southern Brazil [19–21] and go against the recommendations of the American Academy of Pediatrics and the Brazilian Society of Pediatrics, which, in order to prevent sudden infant death syndrome, recommend a safe sleep environment that includes supine positioning and room-sharing (without bed-sharing) in infants up to one year of age [22]. The present findings may be related to low SES,

Table 6
Regional distribution and sleep disturbance rates.

Region	Total	Without SDs	With SDs, N (%)
0–3 years of age (N = 350)			
North	35	32	3 (8.6)
Northeast	95	78	17 (17.9)
Midwest	30	24	6 (20.0)
Southeast	130	96	34 (26.1)
South	60	50	10 (13.7)
Total	350	280	70 (20.0)
4–12 years of age (N = 450)			
North	45	38	7 (15.5)
Northeast	149	95	54 (36.2)
Midwest	35	31	4 (11.4)
Southeast	145	130	15 (10.3)
South	76	52	24 (31.6)
Total	450	346	104 (23.1)
13–19 years of age (N = 380)			
North	42	36	6 (14.3)
Northeast	100	66	34 (34.0)
Midwest	38	21	17 (44.7)
Southeast	134	90	44 (32.8)
South	66	40	26 (39.4)
Total	380	253	127 (33.4)

SD, sleep disturbances.

Table 7
Association between socioeconomic status and risk of sleep disturbances.

SES level	OR[a] (95% CI)	p
0–3 years of age		
Low	**3.07 (0.80–11.78)**	**0.04**
Lower middle	2.67 (0.72–9.92)	0.14
Middle	1.05 (0.26–4.21)	0.93
Upper middle	2.61 (0.69–9.81)	0.15
High	2.13 (0.53–8.53)	0.28
4–12 years of age		
Low	3.12 (0.86–11.28)	0.08
Lower middle	**5.36 (1.84–15.62)**	**0.00**
Middle	2.61 (0.91–7.47)	0.07
Upper middle	2.39 (0.84–6.79)	0.54
High	1.58 (0.53–4.75)	0.45
13–19 years of age		
Low	1.26 (0.55–2.92)	0.57
Lower middle	2.32 (1.00–5.38)	0.56
Middle	1.20 (0.47–3.02)	0.69
Upper middle	1.87 (0.71–4.93)	0.20
High	**3.81 (1.64–8.85)**	**0.00**

Bold indicates statistical significance. CI, confidence interval; OR, odds ratio; SES, socioeconomic status.
[a] Obtained by bivariate logistic regression (Wald test; $p \leq 0.05$).

thereby involving public health issues, lack of guidance regarding sleep position during routine medical visits [23], and poor housing conditions. Moreover, the high co-sleeping rate identified in children aged 4–12 years, although consistent with previous data reported in the literature [24], may also indicate a Brazilian socioeconomic issue related to the large number of children per household associated with low family income, which increases the likelihood of bed-sharing, thus leading to future complications such as increasing resistance to sleep, poor sleep quality, and daytime sleepiness.

The association between watching television before sleep and increased SDs found in the present study is consistent with the results of a Chinese multicenter study, which evaluated children <4 years of age and found a high rate of SDs in those exposed to television in the environment, concluding that having a television in the sleeping environment is associated with later bedtime, shorter sleep duration, and longer sleep onset latency [25]. The association between SDs and use of electronic devices was particularly high among adolescents aged 13–19 years and was related to higher SES. It can therefore be assumed that their high purchasing power allows them access to such technology, which ultimately interferes directly with their sleep quality. Our data are consistent with those of studies showing that technological advances increase this risk, as reported in a study of 960 Hong Kong adolescents (aged 10–19 years) in which 86% of the sample used electronic devices daily and 50% experienced sleep deprivation [26]. Also, the higher risk of SDs in adolescents using medications is consistent with evidence from a recent study in which members of the American Academy of Child and Adolescent Psychiatry, when asked about their experience with patients with SDs, reported that sleep was considered a problem for one-third of their patients, of whom one-fourth required pharmacotherapy [27].

Based on the recommendations of the National Sleep Foundation, we found that total nocturnal sleep time was below the recommended values in children and within the low end of the range of recommended values in adolescents, indicating problems in bedtime routine [28]. Reduced sleep duration could also be due to inadequate time available for sleep. The overall SD prevalence of 25% is similar to that reported in previous national [6–8] and international [5,25,26] studies. Additionally, we found an association between the presence of SDs and parents/caregivers asking about the child's sleep during routine medical visits. This finding highlights the importance of parental questioning of the child's sleep during pediatric visits, which should include objective questions about the child's sleep and the use of validated instruments specific to the Brazilian population [11–14,29].

In some age groups, higher SD rates were observed in specific regions of the country, such as in the Southeast (0–3 years), Northeast (4–12 years), and Midwest (13–19 years), but with no significant difference between the regions. These rates may be related to the human development index (HDI) used by the United Nations to analyze the quality of life of a given population [3]. Therefore, although Brazil shows great regional socioeconomic disparities, there was an association between SDs and low SES in the Southeast (second HDI), lower middle SES in the Northeast (fifth HDI), and high SES in the Midwest (third HDI), emphasizing a regional and economic impact on the occurrence of SDs. These findings are in agreement with a study that found differences in the sleep patterns of children from culturally different regions, concluding that sleep parameters (short sleep duration, nocturnal awakenings, and sleep onset problems) were significantly associated with social problems [30].

Limitations of this study include data collected through questionnaire, and geographical factors that may interfere with data collection in a country of continental dimensions.

5. Conclusions

The results obtained in the present study suggest that, in a sample of Brazilian children and adolescents representative of the Brazilian population under study, there is a high prevalence of inadequate sleep habits and mean total nocturnal sleep time below the recommended values. The SD prevalence rate can be considered similar to international rates, associated in different proportions with SES depending on the age group. No regional differences were observed in the occurrence of SDs. These findings point to the need for greater attention to the child's sleep in routine medical visits, aiming at early diagnosis and treatment, thus minimizing potential risks to the health of the pediatric population.

Conflict of interest

The authors have no conflicts of interest to disclose.

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: https://doi.org/10.1016/j.sleepx.2019.100007.

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