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Association between sleep disorders on children, sociodemographic factors and the sleep of caregivers.

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ABSTRACT

Aim: To analyze the association between children's sleep disorders, sociodemographic factors, and caregivers' sleep.

Method: An Epidemiological, cross-sectional, analytical study, with a quantitative approach, was carried out in two public schools in the Northeast of Brazil. The participants were 222 students, aged between 6 and 11 years old, and 123 caregivers. The Sleep Disturbance Scale in Children was used for the children's evaluations. The caregivers' sleep was analyzed using the Pittsburgh Sleep Quality Index and the Epworth Sleepiness Scale.

Results: Regarding the sleep disorders in children, 60.8% had good sleep quality. Most of them had an adequate number of sleep hours, studied in the afternoon, spent less than two hours in front of screens, and had no reports of illnesses. There was a significant relationship between those caregivers outside the home and the children with an adequate number of hours of sleep. Children with poor sleep quality had a predominance of enuresis. There was an association between good quality of sleep and physical activity during free time and the acceptance of school meals. Children with good sleep quality predominated seemed to be the ones in the care of caregivers who did not present excessive daytime sleepiness and reports of illnesses.

Conclusion: The data found suggest the need to conduct new strategies that can promote more quality to children's sleep, with caregivers and the pre-school educational community.
Keywords: Family-Relations; Sleep-Wake Disorders; Socioeconomic-factors**.**

RESUMEN

Asociación entre los trastornos del sueño de niños y niñas, los factores sociodemográficos y el sueño de sus cuidadores.

Objetivo: Analizar la asociación entre los trastornos del sueño de niños y niñas, los factores sociodemográficos y el sueño de sus cuidadores.
Método: Estudio epidemiológico, transversal, analítico y con enfoque cuantitativo. Fue desarrollado en dos escuelas públicas del nordeste de Brasil. Los participantes fueron 222 estudiantes de 6 a 11 años y 123 cuidadores. Se utilizó la escala de alteración del sueño para niñas y niños. El sueño de las personas cuidadoras se analizó mediante el índice de calidad del sueño de Pittsburgh y la escala de somnolencia de Epworth.
Resultados: En la escala de trastornos del sueño para niñas y niños, el 60,8 % tenía buena calidad de sueño. La mayoría de los niños y niñas con horas de sueño adecuadas estudiaban por la tarde, pasaban menos de dos horas frente a las pantallas y no tenían informes de enfermedad. Hubo una relación significativa entre cuidadores sin empleo extrafamiliar y las horas de sueño adecuadas para la niña o el niño. Los niños y las niñas con mala calidad del sueño tenían predominio de enuresis. Hubo una asociación entre la buena calidad del sueño, la actividad física durante el tiempo libre y la aceptación de las comidas escolares. Entre las personas cuidadoras que no presentaron excesiva somnolencia diurna y relatos de enfermedad, predominaron niñas y niños con buena calidad de sueño.
Conclusión: Los datos encontrados sugieren la necesidad de ejecutar nuevas estrategias con los cuidadores y la comunidad educativa preescolar, que promuevan una mejor calidad del sueño de las personas infantes.
Palabras claves: Factores-socioeconómicos; Relaciones-Familiares; Trastornos-del-Sueño-Vigilia.

RESUMO

Associação entre distúrbios do sono em crianças, fatores sociodemográficos e sono de cuidadores

Objetivo: analisar a associação entre distúrbios do sono infantil, fatores sociodemográficos e sono dos cuidadores.

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Método: Estudo epidemiológico, transversal, analítico, com abordagem quantitativa, desenvolvido em duas escolas públicas do Nordeste do Brasil. Os participantes foram 222 estudantes, com idades entre 6 e 11 anos, e 123 cuidadores. Foi utilizada a escala de distúrbios do sono em crianças. O sono dos cuidadores foi analisado por meio do índice de qualidade do sono de Pittsburgh e Escala de Sonolência de Epworth.

Resultados: Na escala de distúrbios do sono em crianças, 60,8% tinham boa qualidade do sono. A maioria das crianças com horas de sono adequadas estudavam no período vespertino, passavam menos de duas horas em frente das telas e não tinham relato de doença. Houve relação significante entre cuidadores sem vínculo empregatício extradomiciliar e horas adequadas de sono da criança. Crianças com má qualidade do sono apresentaram predomínio de enurese. Houve associação entre boa qualidade do sono e prática de atividade física em horário livre e aceitação da refeição escolar. Entre os cuidadores que não apresentaram sonolência diurna excessiva e relato de doença, predominou as crianças com boa qualidade do sono.

Conclusão: Os dados encontrados sugerem a necessidade de conduzir novas estratégias que possam promover mais qualidade ao sono de crianças, junto dos cuidadores e da comunidade educativa pré-escolar.

Palavras chave: Distúrbios-do-sono-vigília; Fatores-socioeconômicos; Relações-Familiares.

INTRODUCTION

Sleep is a vital function for health. It is as important as nutrition and has profound implications for people's well-being[1]. Good quality sleep is necessary throughout the human life cycle to restore the physical and psychological conditions of the organism after waking up[2,3]. Sleep deprivation weakens the body's immune system, decreases cognitive performance, and difficulties the children and adults' concentration while learning[4,5].

Sleep deprivation can cause disorders in the regulation of emotions and behavior; it can also cause depression and anxiety[5], increased risk of domestic and traffic accidents[6], obesity[7], among other problems. As the mentioned disorders show, low quality and shortened sleep has a negative impact on health and the overall quality of life[8]. However, sleep disorders and sleep deprivation remain highly common in contemporary society[6].

Sleep disorders in children may negatively impact the parents' and caregivers' sleep patterns as well; the need for nocturnal awakenings to take care of the child's health needs increases the frequency of sleep interruptions[8].

Notwithstanding, the parents' sleep-vigil pattern, especially the mothers' one, may also be a predictive element of the children's sleep-vigil pattern due to the connection that these behaviors have between each other and the feedback between themselves[9].

Parents have to now deal with the responsibility of monitoring their own activities and distractions that interfere in the sleep and/or care of their children (e.g.watching television or using electronic devices). However, some parents are unaware of the ideal

amount of sleep for children, and some others do not have the disciplinary skills to effectively manage their child's behavior and encourage their sleep either[10].

A study in Iran showed that cell phone use at night was associated with poorer quality of sleep in children, and those physically active children had better quality and longer sleep. Furthermore, the participants with a higher body mass index also had shorter total sleep time[11]. A similar study also found that children who did not exercise and had access to tablets, television, or smartphones had lower sleep quality, and this, in turn, generated sleep disturbances[12].

Caring for a child with a sleep disorder or a chronic illness is hard work for parents and can affect their sleep[13]. Given the extenuating efforts required to take care of children with one of these conditions, caregivers are more likely to suffer from physiological and psychiatric problems[14]. Nevertheless, children in the care of parents who suffer from chronic illnesses—or who have poor sleep patterns—tend to display more sleep problems.

As the previous paragraphs suggest, it is inferred that the problems related to the children's sleep patterns can also have a direct relationship with the parents' and caregivers' poor quality sleep. During adulthood, sleep restriction—in addition to the already mentioned problems—also affects role performances and impairs parental relationships[8].

Another consulted study infers that family context contributes to the quality of sleep of children because of the influence that each family's patterns/routines and socioeconomic conditions—among other factors—have on the children's habits[15]. Sociodemographic factors, such as family income, place of residence, and work, can also significantly increase the negative perception of sleep in children and their caregivers.

Facing this, the following research question arises: "Are the sociodemographic factors and the sleep of parents and/or caregivers associated with children`s sleep disorders?" This study hypothesizes that there is a link between sleep disorders in children, the caregivers' sleep, and the influence of sociodemographic conditions.

The study aimed to analyze the relationship among children's sleep disorders, sociodemographic factors, and caregivers' sleep.

METHOD

Design and sample

An epidemiologic, transversal and analytic study with a quantitative approach was carried out in two public schools from Redenção (Northeast Brazil). The sample size was defined using a simple random sampling technique without replacement. The researchers calculated the sample from a finite population with a prevalence of sleep disorders in children of 30%[16] and obtained an *n* value of 211; in this case, a confidence level of 95% was selected. Students with cognitive and/or reading or writing disabilities—as reported by the caregivers and/or teachers—were excluded from the study.

The final sample was 222 students of both sexes, aged between 6 and 11 years old, and 123 caregivers.

Eligibility criteria

Children (and their respective caregivers) who met the following criteria were included:

- Being a resident of the municipality of Redenção (CE)
- Being properly enrolled in school
- Being in the age range of the classification relating to childhood (6 to 12 years)
- Attending school during the pre-established period for data collection

Children diagnosed with cognitive and/or reading or writing-related impairments were excluded from the study; students on sick leave during the study period were excluded as well. Each caregiver was identified by the school's registration forms.

Independent variables

Gender, age, weight, height, body mass index (BMI), neck circumference (NC), waist circumference (WC), waist-height relation (WHR), systolic (SBP) and diastolic (DBP) blood pressure, possession of electronic devices (television, personal computer, cell phone, and/or tablet), amount of hours facing a screen, physical activity, sleep hours, defined hour to go to bed and the caregivers' sleep.

Dependent variables

Sleep disorders during childhood through the SDSC.

Data collection

The data were collected from March to December 2017 using an instrument with the already mentioned dependent and independent variables. An evaluation team performed the anthropometric evaluation and blood pressure measurements. The parents and/or caregivers were interviewed to collect the data by evaluating the children's sleep and theirs.

For the children's sleep evaluation, the study used a Brazilian Portuguese translation of the Sleep Disturbance Scale for Children (SDSC)[17]. Since its creation, this instrument has been used as an evaluation tool for clinical samples[18] and the monitoring of healthy children[19], thus being an object of translation to different languages[20,21].

The SDSC is a survey with 26 *Likert*-type items[21] (Never, Occasionally (1 or 2 times a month), Sometimes (1 or 2 times a week), Almost always (3 or 5 times a week), Always (every day)) that evaluates the sleep of children and adolescents from 3 to 18 years old in the last six months. The main research points on sleep disturbances are the following: onset and maintenance, respiratory, on awakening, during the sleep-wake transition, excessive daily sleepiness, and hyperhidrosis. The final SDSC score can vary from 26 to 130; higher numerical values reflect greater clinical severity of symptoms. As the SDSC does not determine a cutoff point, the average value reached by the students (38.2 points) was adopted as the cutoff value that separates the good quality and poor sleep quality groups. The students with poor sleep quality were considered to have higher-than-average scores, and the prevalence was 38.2%. Children with scores ≤ 38.2 were considered to have good sleep quality.

A pilot test was performed on five children to identify possible weaknesses or difficulties during the application of the instruments. After the analysis by two specialists, no adjustments to the data collection instrument were necessary.

For the caregivers' sleep, the study used a Brazilian Portuguese version of the Pittsburgh Sleep Quality Index (PSQI). The internal consistency study carried out for this instrument revealed reasonable values (0,698) for the global Cronbach's alpha. The PSQI was created by Buysse et al. (1989) and evaluates the individuals' sleep quality in the last 30 days, based on 19 self-administered questions that generate seven components: 1: Subjective sleep quality; 2: Sleep latency; 3: Duration of sleep; 4: Usual sleep efficiency; 5: Sleep disorders; 6: Use of medication to sleep; 7: Daytime sleepiness and dysfunction during the day[22]. The maximum score is 21 points; scores higher than 5 already determine a poor quality of sleep pattern. The global index, based on the sum of the scores for each component classifies individuals into "good sleepers" (PSQI <5) or "bad" sleepers (PSQI ≥ 5). Scores greater than five denote that the individual may be having great difficulty in at least two components or moderate difficulty in more than three components[22].

The assessment of daily excessive sleepiness was performed using the Epworth Sleepiness Scale (ESE). The ESE is a valid and reliable instrument for the assessment of daytime sleepiness. It is a self-administered questionnaire that assesses the probability of falling asleep in eight situations involving daily activities, some of which are known to be highly soporific[23,24]. The global score ranges from 0 to 24; those scores above 10 may suggest the existence of ESE[24]. The internal consistency, measured by Cronbach's alpha, was 0.76 and 0.79, respectively, for the ESE-BR and the original ESE.

The ESE assesses the likelihood of a person to start napping while:

- Sitting and reading, watching TV, sitting quietly in a public place
- Riding in the car for an hour without stopping as a passenger
- Sitting quietly after lunch without drinking alcohol
- Being in a car stopped in a traffic jam for a few minutes

This instrument has a Likert scale (0 - no probability of falling asleep; 1 - slight probability of falling asleep; 2 - moderate probability of falling asleep; 3 - strong probability of falling asleep)[15]. The interviewees who presented a total sum in the ESE from 0 to 5 points were classified as normal (good sleep); the ones who obtained between 6 to 8 points were considered to be displaying medium drowsiness. The ones who got between 9 and 24 points were considered to be suffering from excessive drowsiness[26].

Regarding the anthropometric examination, the weight was obtained using a digital G-Tech® scale of with a capacity of 200 kg and an accuracy of 0.05 kg; the participants were barefoot and wore light clothing during the measurements. The height was measured with an inextensible and flexible anthropometric measuring tape whose total size was 1.5 m with 0.1m divisions. This tape was attached to the wall at 90º from the floor. For both measures, the participants were told to stand up with their arms extended along their body and the head adjusted into Frankfurt's plane.

For the classification of BMI, the researchers employed the World Health Organization (WHO) Z score curves for individuals aged 5 to 19 years[27]. The measures of the neck circumference (NC) and waist circumference (WC) were taken with an inextensible and flexible Sanny® measuring. After positioning the participants standing position, the WC was taken in the midpoint between the last floating rib and the superior border of the iliac crest, at the end of exhalation. The NC was measured in the neck's midpoint, just below the laryngeal prominence[28]. For the WC he cut-off points proposed by the WHO for the population aged 3 to 19 years were considered[29]. Likewise, for the NC, the cut-off points proposed for the pediatric population[23].

For the WHR, the study used cutoff points for children and adolescents between 6 to 14 years old[24]. For both genders, the participants that displayed WHR values above 0.48 were classified as overweight; in the case of obesity, the values considered were those above 0.5 for women and 0.51 for men.

To verify the BP, the study used aneroid *Tycos*® sphygmomanometers and *Welch Allyn*® arm cuffs of different sizes. In addition, a *Littman*® biauricular stethoscope was also used. The student's handling and the BP classification followed the VII Brazilian Guideline for Arterial Hypertension[30].

Data analysis

The data were tabulated on Excel spreadsheets and analyzed with the SPSS software (version 24). Absolute and relative frequencies were calculated for the qualitative variables. The quantitative variables were summarized through the following dispersions: median, standard deviation, quartiles, minimum, and maximum.

The significance between the independent (or explanatory) and dependent variables was verified using Fisher's exact test or the Chi-square test. Variables that showed a descriptive level lower than 0.20 were confronted again with the outcomes through a multiple analysis with Poisson's regression model.

The magnitude of the associations between the variables in the Poisson regression model and the outcome were expressed with point estimates and intervals of prevalence ratios. Variables with a descriptive level below 0.05 remained in the model (Caregiver who works outside the home, shift that the child studies, report of the child's illness).

Ethical aspects

The research was approved by the ethics committee for research with human beings from the Universidade da Integração Internacional da Lusofonia Afro-Brasileira under the embodied report 2.296.842/2017. All parents and/or caregivers signed the terms of consent to participate in the study.

RESULTS

Children's Characterization

Most of the children were females (55.4%) without a diagnosis of diseases (87.8%); they displayed normal arterial blood pressure (94.1%) and had a sedentary lifestyle (60.8%). They also reported that they studied in the evenings (55%) and had brown skin (62.2%). The age varied between 6 - 8 (44.1%) and 9 - 11 years old (55.9%); the average value for the age was 8.6 ± 1.4 years old. Regarding inactivity, most of the children (52.7%) stated that they did physical activities during their free time.

Almost half of the participants were eutrophic (48.2%) whereas 16.2% and 18.9% of the participants were classified as cases overweight and obesity respectively. The anthropometric evaluation revealed that most of them (70.3%) had normal abdominal circumference and waist-height relation (59.5%). A percentage of 59.5% of the investigated children presented altered neck circumference for their age.

Most of the children (93.2%) had a meal before going to school, under the supervision of the parents at their homes (91.9%). In these cases, the habit of watching television was common (72.5%). Most of the children (81.1%) accepted school meals.

Regarding access to the Internet, approximately, half of the children reported having this service at home (51.4%); they also stated that they used tablets and/or cell phones (68.5%). Most children (83.3%) spend >2 hours in front of screens. Notwithstanding, most of these children (56.8%) had no television or personal computer in their sleep place.

Most of the children did not wet their bed (72.1%); they did not report suffering from sleep hyperhidrosis (99.1%) or respiratory complaints during vigil (90.5%) either. Moreover, no children reported problems to initiate or maintain their sleep; they did not report problems related to awakenings or sleep-vigil transition either.

Regarding bedtime, 65.3% of the children had a defined hour to go to bed, and 64.9% reported having an adequate amount of sleep. The global SDSC ≤ 39 was 60.8% (MD: 38.2 ± 6.6).

Caregivers' characterization

Most of the caregivers (86.9%) were females; more specifically, they were mothers (80.2%) taking care of their home (66.2%). The majority did not report any diagnosis of chronic disease (73%). They did not report the use of continuous medications (70.3%). The group is characterized by young caregivers in the average age group of 36.9 ± 8.6 years old.

Regarding their sleep, 55% had a good quality sleep, did not show excessive daily drowsiness (84.2%), and did does not use medication to sleep (82%). A total of 41.4% evaluated their children's

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sleep as good (41.4%) whereas 34.2% of them evaluated it as particularly good. On average, their PSQI score was 4.8 ± 2.8 points.

Association between the sleep of children and caregivers

Most children that studied during the evening (p<0.001), that spent > 2 hours in front of screens (p=0.024), and that did not report pre-existing diseases (p=0.018) reported adequate sleep hours (Chart 1 and 2).

There was a significant statistical association between the variables "do not go to work" and "the child's adequate amount of sleep" (p=0.048). There was no association between the classification of the children's sleep hours and the caregivers' sleep quality and drowsiness (Chart 3).

Bladder eliminations in bed were common in the participants with SDSC values > 39 points, that is, with bad sleep quality (p = 0.018).

The variables of physical practice during free time (p = 0.049) and acceptance of school meals (p=0.008) seemed to be linked with SDSC values ≤ 39 points (good sleep quality) (Chart 4 and 5).

Among the caregivers that did not show excessive daily drowsiness (p=0.046) and did not report suffering from diseases (p=0.009), predominated the children with SDSC ≤ 39 points (good sleep quality).

There was a relationship between the variables "evaluation of the child's sleep" and SDSC (p=0.010). In this case, one perceives that most of the cases of SDSC ≤ 39 points are common in the caregivers that evaluated their child's sleep quality as good or very good (Chart 6).

In the proposed regression model, one observes that the factors associated with "inadequate number of sleeping hours in children" were:

- Caregiver goes to work (p=0.015): 54% of these cases showed higher values of inadequate sleeping hours.

Chart 1

Association between the classification of sleep hours of children and sociodemographic variable. Brazil, 2018.

Variables	Hours of sleep				P-value
	Inadequate		Adequate		
Study period					<0,001[1]
Morning	52	52.0	48	48.0	
Evening	26	21.3	96	78.7	
Age group					0.903[1]
6 to 8	34	34.7	64	65.3	
9 to 11	44	35.5	80	64.5	
Gender					0.614[1]
Female	45	36.6	78	63.4	
Male	33	33.3	66	66.7	
Skin color					0.070[2]
White	28	45.2	34	54.8	
Black	2	12.5	14	87.5	
Brown	45	32.6	93	67.4	
Yellow	1	50.0	1	50.0	
Other	2	50.0	2	50.0	
BMI					0.434[2]
Obese	16	38.1	26	61.9	
Overweight	15	41.7	21	58.3	
Eutrophic	38	35.5	69	64.5	
Underweight	9	24.3	28	75.7	
Overweight or obesity					0.290[1]
With overweight/obesity	31	39.7	47	60.3	
Without overweight/obesity	47	32.6	97	67.4	
Abdominal circumference					0.803[1]
Altered	24	36.4	42	63.6	
Normal	54	34.6	102	65.4	
Waist-height Relation					0.210[1]
Altered	36	40.0	54	60.0	
Normal	42	31.8	90	68.2	
Arterial pressure					0.147[2]
Altered	2	15.4	11	84.6	
Normal	76	36.4	133	63.6	

[1] Chi-square Test; [2]Exact test of Fisher

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Chart 2

Association between the classification of sleep hours of children and children's health. Brazil, 2018.

Variables	Hours of sleep				P-value
	Inadequate		Adequate		
Eating in front of the TV					0.150[1]
Yes	52	32.3	109	67.7	
No	26	42.6	35	57.4	
Internet at home					0.563[1]
Yes	38	33.3	76	66.7	
No	40	37.0	68	63.0	
Hours facing a screen					**0.024[1]**
< 2 hours	19	51.4	18	48.6	
> 2 hours	59	31.9	126	68.1	
Possession of tablet or cell phone					0.902[1]
Yes	53	34.9	99	65.1	
No	25	35.7	45	64.3	
TV or computer in the sleeping place					0.439[1]
Yes	31	32.3	65	67.7	
No	47	37.3	79	62.7	
Active or sedentary lifestyle					0.484[1]
Active	33	37.9	54	62.1	
Sedentary	45	33.3	90	66.7	
Neck circumference					0.210[1]
Yes	36	40.0	54	60.0	
No	42	31.8	90	68.2	
Bedwetting					0.070[1]
Yes	16	25.8	46	74.2	
No	62	38.8	98	61.3	
Defined hour to sleep					0.544[1]
Yes	53	36.6	92	63.4	
No	25	32.5	52	67.5	
Report of disease					**0.018[1]**
Yes	15	55.6	12	44.4	
No	63	32.3	132	67.7	
Accepts school meals					0.244[1]
Yes	60	33.3	120	66.7	
No	18	42.9	24	57.1	
Eats before going to school					0.683[1]
Yes	72	34.8	135	65.2	
No	6	40.0	9	60.0	
Meals completed with supervision					0.728[1]
Yes	71	34.8	133	65.2	
No	7	38.9	11	61.1	
Practices physical activities during free time					0.755[1]
Yes	40	34.2	77	65.8	
No	38	36.2	67	63.8	

[1] Chi-square Test; [2]Exact test of Fisher

Chart 3

Association between the classification of the children's sleep hours and variables related to the caregiver. Brazil, 2018.

Variables	Child's hours of sleep				P-Value
	Inadequate		Adequate		
Caregiver's sleep quality[3]					0.561[2]
Good quality	40	32.5	83	67.5	
Poor quality	35	39.3	54	60.7	
Presence of disturbances	3	30.0	7	70.0	
Caregivers daily drowsiness[4]					1.000[2]
No	66	35.3	121	64.7	
Yes	12	34.3	23	65.7	
Genitor					0.577[1]
Mother	64	36.0	114	64.0	
Father	10	37.0	17	63.0	
Caregiver's kinship					0.607[1]
Grandparents/uncles	4	23.5	13	76.5	
Mother	64	36.0	114	64.0	
Others	14	31.8	30	68.2	
Caregiver goes to work					**0.048[1]**
Yes	33	44.0	42	56.0	
No	45	30.6	102	69.4	
Caregiver reports insomnia					0.110[1]
Yes	25	43.9	32	56.1	
No	53	32.1	112	67.9	
Caregiver reports disease					0.329[1]
Yes	18	30.0	42	70.0	
No	60	37.0	102	63.0	
Caregiver uses medication to sleep					0.729[1]
Yes	15	37.5	25	62.5	
No	63	34.6	119	65.4	
Caregiver uses other medications					0.954[1]
Yes	23	34.8	43	65.2	
No	55	35.3	101	64.7	
Caregiver evaluation of the child's sleep quality					0.227[2]
Very poor	2	25.0	6	75.0	
Poor	22	47.8	24	52.2	
Good	31	33.7	61	66.3	
Very good	23	30.3	53	69.7	

[1] Chi-squre test; [2] Exact test of Fisher; [3] Pittsburgh Sleep Quality Index; [4] Epworth's classification

- The child studies during the morning period (p<0.001): participants with this feature exceeded by 139% the cases of inadequate sleeping hours if compared to the ones that studied during the evening period (this can also be interpreted as 2.39 times bigger).

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- The child has a disease (p=0.008) PR=1.77 (Chart 7).

On another regression model—whose outcome was an SDSC > 39 (bad quality sleep)—the following associated factors were identified: positive report of diseases from the parents (p=0.010), bedwetting (p=0.011), and the non-acceptance of school meals (p=0.005).

Chart 4

Association between Childrens' sleep disorders (global SDSC) and sociodemographic variable. Brazil, 2018.

Variables	Global score > 39 Bad quality sleep		Global score ≤ 39 Good quality sleep		P-value
Study period					0.437[1]
Morning	42	42.0	58	58.0	
Evening	45	36.9	77	63.1	
Age group					0.223[1]
6 to 8	34	34.7	64	65.3	
9 to 11	53	42.7	71	57.3	
Gender					0.439[1]
Female	51	41.5	72	58.5	
Male	36	36.4	63	63.6	
Skin color					0.075[2]
White	27	43.5	35	56.5	
Black	6	37.5	10	62.5	
Brown	50	36.2	88	63.8	
Yellow	0	0	2	100	
Other	4	100	0	0	
BMI categories					0.224[1]
Obese	22	52.4	20	47.6	
Overweight	15	41.7	21	58.3	
Eutrophic	37	34.6	70	65.4	
Underweight	13	35.1	24	64.9	
Overweight or obesity					0.064[1]
With overweight/obesity	37	47.4	41	52.6	
Without overweight/obesity	50	34.7	94	65.3	
Abdominal circumference					0.122[1]
Altered	31	47.0	35	53.0	
Normal	56	35.9	100	64.1	
Waist height relation					0.185[1]
Altered	40	44.4	50	55.6	
Normal	47	35.6	85	64.4	
Blood pressure classification					0.956[1]
Altered	5	38.5	8	61.5	
Normal	82	39.2	127	60.8	

[1] Chi-square test; [2] Exact test of Fisher

Chart 5

Association between Childrens' sleep disorders (global SDSC) and children's health variables. Brazil, 2018.

Variables	Global score > 39 Bad quality sleep		Global score ≤ 39 Good quality sleep		P-value
Eating in front of the TV					0.117[1]
Yes	58	36.0	103	64.0	
No	29	47.5	32	52.5	
Internet at home					0.118[1]
Yes	39	34.2	75	65.8	
No	48	44.4	60	55.6	
Hours in front of screens					0.854[1]
< 2 hours	15	40.5	22	59.5	
> 2 hours	72	38.9	113	61.1	
Possession of tablet or cell phone					0.472[1]
Yes	62	40.8	90	59.2	
No	25	35.7	45	64.3	
TV or computer in the sleeping place					0.653[1]
Yes	36	37.5	60	62.5	
No	51	40.5	75	59.5	
Active or sedentary lifestyle					0.413[1]
Active	37	42.5	50	57.5	
Sedentary	50	37.0	85	63.0	
Neck circumference					0.628[1]
Yes	37	41.1	53	58.9	
No	50	37.9	82	62.1	
Bedwetting					**0.018[1]**
Yes	32	51.6	30	48.4	
No	55	34.4	105	65.6	
Defined hour to go to bed					0.598[1]
Yes	55	37.9	90	62.1	
No	32	41.6	45	58.4	
Report of disease					0.309[1]
Yes	13	48.1	14	51.9	
No	74	37.9	121	62.1	
Accepts school meals					**0.008[1]**
Yes	63	35.0	117	65.0	
No	24	57.1	18	42.9	
Eats before going to school					0.245[1]
Yes	79	38.2	128	61.8	
No	8	53.3	7	46.7	
Accomplish meals accompanied					0.978[1]
Yes	80	39.2	124	60.8	
No	7	38.9	11	61.1	
Practices physical activities during free time					**0.049[1]**
Yes	53	45.3	64	54.7	
No	34	32.4	71	67.6	

[1] Chi-square test; [2] Exact test of Fisher

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Chart 6

Association between children's sleep disorders (global SDSC) and caregivers-related variables. Brazil, 2018.

Variable	Global score				P-value
	> 39 Bad sleep quality		≤ 39 Good sleep quality		
Sleep quality[3]					0.087[2]
Good	41	33.3	82	66.7	
Poor	40	44.9	49	55.1	
Presence of disturbance	6	60.0	4	40.0	
Caregiver's daily drowsiness[4]					**0.046[1]**
No	70	37.4	117	62.6	
Yes	17	48.6	18	51.4	
Genitor					0.459[1]
Mother	67	37.6	111	62.4	
Father	11	40.7	16	59.3	
Caregiver's kinship					0.342[1]
Grandparents/Uncles	9	52.9	8	47.1	
Mother	67	37.6	111	62.4	
Others	20	45.5	24	54.5	
Caregiver goes to work					0.860[1]
Yes	30	40.0	45	60.0	
No	57	38.8	90	61.2	
Caregiver reports insomnia					0.402[1]
Yes	25	43.9	32	56.1	
No	62	37.6	103	62.4	
Caregiver reports disease					**0.009[1]**
Yes	32	53.3	28	46.7	
No	55	34.0	107	66.0	
Caregiver uses medication to sleep					0.057[1]
Yes	21	52.5	19	47.5	
No	66	36.3	116	63.7	
Caregiver uses other medications					0.122[1]
Yes	31	47.0	35	53.0	
No	56	35.9	100	64.1	
Caregivers evaluation of their child's sleep quality					**0.010[2]**
Very poor	3	37.5	5	62.5	
Poor	24	52.2	22	47.8	
Good	41	44.6	51	55.4	
Very good	19	25.0	57	75.0	

[1] Chi-square test; [2] Exact test of Fisher

Chart 7

Poisson's regression for inadequate sleeping hours (child) as a dependent variable. Brazil. 2018.

Model's variables	PR[1]	CI 95%[2]	P-value
Caregiver goes to work			**0.015**
Yes	1.54	1.09 - 2.17	
No	1	-	
Period where the child studies			**<0.001**
Morning	2.39	1.63 - 3.51	
Evening	1	-	
Report of disease (child)			**0.008**
Yes	1.77	1.16 - 2.69	
No	1	-	

PR: Prevalence Ratio; CI: Confidence Interval of 95%

DISCUSSION

The present study shows a global SDSC ≤ 39 (good sleep quality) of 60.8%; this is consistent with other similar studies in which most children proved to have good sleep quality[12,31]. Sleep quality is crucial for well-being during the day and for improving performance in each child's activities. Childhood is characterized by a large number of changes in neuromotor growth; therefore, physical rest and recovery is extremely important for children due to their impact on child growth and development[32].

Children with adequate hours of sleep studied in the afternoon, spent less than two hours on screens, and had no reports of illness. Studying on the afternoon shift can provide more hours of sleep as there is no need to wake up early to arrive in time for school. Some consulted studies reveal the negative influence of screens (smartphones, television, tablets) on sleep quality[33]. Furthermore, healthy children have less damage to the sleep-wake pattern[12].

Children whose caregivers had no employment relationship outside the home were classified as having adequate hours of sleep. When caregivers—

especially mothers—are dedicated exclusively to the activities of the home, they can pay more attention and time to the development and care of their children's actions; this includes even sleep hygiene habits. The fact is that the regression model showed that among caregivers who work outside the home, inadequate hours of sleep prevailed. One consulted study reports that mothers who worked between 20-40 hours a week have children with sleep deprivation[34].

It is noteworthy to highlight that health professionals can help mothers with an employment contract outside the home to find a model of childcare that keeps the mother at home at night to stay with the child[35].

A relationship was observed between enuresis and children with poor sleep quality. Consistent with this finding, Brazilian researchers infer those children with enuresis have sleep disorders that impair the quality of the sleep-wake state[36]. Nocturnal enuresis and obstructive sleep apnea (OSA) are frequent problems in childhood and appear to be related. A study on the urological outcome of treatment for OSA in enuretic children identified that both disorders have an underlying mechanism which provides altered excitatory response and sleep fragmentation[37].

The practice of physical activity during free time and the acceptance of school meals were linked with good sleep quality. This was consistent with one reviewed study in which the practice of physical activity improved the subjective and objective perception of sleep quality[38]. Previous studies also confirm that physically active children have better sleep quality[11,12].

The practice of regular physical activity can also contribute to the quality of life by:

- Improving the cardiorespiratory and muscular capacities,
- Controlling the body mass
- Reducing depression and anxiety
- Improving the cognitive functions (memory, attention, and reasoning)
- Improving the quality and efficiency of sleep[39].

The World Health Organization (WHO) recommends that children and adolescents aged between 5 and 17 years perform at least 60 minutes of physical activity daily, with intensity ranging from moderate to vigorous, and reiterates that the duration of more than 60 minutes may provide additional health benefits[40].

Regarding school meals, a study in Finland showed that sleep habits are associated with food consumption patterns. The study determined that there is a link between longer sleep and nutrient-rich foods[41]. Adequate energy intake and a quality diet—including vitamins and minerals—can result in high quality sleep and help prevent sleep problems[42].

It seemed that children with good sleep quality were the ones in the care of caregivers who did not present excessive daytime sleepiness. Caregivers who were good sleepers tended to have a more positive view of the student's sleep. About this, researchers tested whether the parents' insomnia symptoms were related to the children's electroencephalogram and maternal sleep perception. Objectively, maternal insomnia appears to be related to greater sleep deprivation and sleep latency, as well as late awakening. When both parents are identified as insomniac, it is likely for their child to suffer from anxiety and resistance at bedtime, in addition to daytime sleepiness. Thus, children's sleep may be associated with parental sleep patterns. However, the parents' own insomnia symptoms can impair the children's perception of sleep-related problems[43].

Another statistical finding of this research was the fact that children with good sleep have caregivers exempt from diseases. As the PSQI score of the caregivers increased (poor sleep quality), there was an increase in the positivity of childhood illness; this

may imply a symbiosis between the children's and their caregivers' sleep.

In previous studies analyzed, an inverse situation was registered: the parents/caregivers of children with chronic diseases experienced the development of sleep disorders (quality and duration) and fatigue in their daily lives[44,45].

In this sample, most health problems were chronic health conditions. Thus, the researchers guess that suffering from a chronic disease is a stressor that can decrease the predisposition of parents and caregivers to monitor their child's sleep hygiene habits or that it can stimulate anxious behavior in their children (vicarious learning) which can harmful, for example, to sleep latency.

It is observed that the parents—as members of the family and responsible for directing the habits inherent to the family context—play a fundamental role in the children's sleep/wake process by stimulating the dependence on their presence at bedtime, performing nighttime interventions to restore the child's sleep and establishing sleep initiation routines[15].

This research has some limitations in its design, such as the fact that it is a sectional study that prevents the establishment of cause and effect (caregiver's sleep versus children's sleep) relationships. Another limitation was the assessment of the participants' sleep using psychometric scales; more accurate results could have been obtained by using other resources and techniques such as actigraphy and/or polysomnography. Finally, this research was carried out in a reduced local sample. Thus, it is suggested to replicate this research question by observing the exposed gaps.

CONCLUSION

Although the quality of sleep was classified as good in most children, several worrying aspects were identified. There seems to be a relationship between the cases of caregivers that perform extra-family work and the cases of children with inadequate sleep hours. Furthermore, there also appears to be a link between the cases of children who wake up early to go to school and those with a certain disease. In addition to the poor quality of children's sleep, there is an association with reports of parental illnesses, enuresis, and refusal to eat in the school environment.

The data found suggest that it is necessary to find new strategies to improve the quality of sleep in children with the support of both caregivers and the preschool educational community. Thus, it is necessary to stratify and identify those children with the greatest need for attention, care and strategies to promote adequate sleep.

CONFLICT OF INTEREST STATEMENT

The authors hereby declare that there is no conflict of interest.

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