Sleep Medicine: X 3 (2021) 100035

Contents lists available at ScienceDirect

Sleep Medicine: X

journal homepage: www.elsevier.com/locate/sleep

Sleep bruxism in children: relationship with screen-time and sugar consumption

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ARTICLE INFO

Article history:
Received 18 January 2021
Accepted 16 April 2021
Available online 24 April 2021

Keywords:
Bruxism
Sugar
Screen time
Children

ABSTRACT

Objective/background: Consumption of added sugar and excessive screen-time is increasing worldwide and is associated with sleeping and behavior disorders, which are related with possible Sleep Bruxism (SB) in children. Therefore, the objective of this investigation was to examine the relationship between screen-time and sugar-consumption and possible SB in children.

Patients/methods: A cross-sectional study, including parents of 460 4- to 8-year-old children, was performed. Frequency of possible SB was assessed with the Children's Sleep Habits Questionnaire; sugar consumption with the Health Behaviour in School-Aged Children Food-Frequency Questionnaire. Comprehensive measures of screen-time (including cell phones, computers, electronic devices, electronic games, and TV) were taken. The time was recorded in hour/day. All data were analyzed with STATA© data analysis and statistical software version 13.0 (Copyright 1996–2016; Stata-Corp LP, College Station, TX, USA). Spearman correlation test and ordinal-multiple-variable regression analyses were used.

Results: Data of 440 subjects Mean age 6.2 years (S.D. 1.8) were analyzed. Prevalence of possible SB was 35% and screen-time was available for 92.9% of the children. Mean screen-time was 2.1 h/day. Parents reported 73% of the children (n = 319) to consume added sugar once a day every day and 20% more than once every day. Correlations of possible SB were statistically significant with screen-time (Rho = 0.8; p = 0.002) and sugar-consumption (Rho = 0.7; p = 0.03). Associations were found between possible SB and increase-to-increase screen-time and sugar-consumption (OR > 2).

Conclusion: The results of this study demonstrated that as screen-time and sugar consumption increased, the frequency of bruxism in children increased.

1. Introduction

Sleep bruxism (SB) is a masticatory muscle activity during sleep, characterized as rhythmic or non-rhythmic and is not a movement disorder or a sleep disorder in otherwise healthy individuals [1]. It is present in 3–40% of children worldwide [2]. In terms of clinical consequences, SB may be classified as not a risk or protective factor, when bruxism is a harmless behaviour; a risk factor, when bruxism is associated with one or more negative health outcomes; and a protective factor, when bruxism is associated with one or more positive health outcomes[1].

Depending on the assessment method, the grading system for SB, establishes possible SB based on a positive self-report only; probable sleep/awake bruxism is based on a positive clinical inspection, with or without a positive self-report; and finally, definite sleep/awake bruxism is based on a positive instrumental assessment, with or without a positive self-report and/or a positive clinical inspection[1]. From an epidemiological point of view, possible SB is the most acceptable method to recruit data in population-based studies[2]. For this purpose, the use of validated instruments, not considering only the presence/absence of SB, but its frequency, is strongly recommended.

The regulation of SB is mainly centrally [3], which means that even when SB is not a pathology or a disorder itself, it could be a possible alarm or symptom of health conditions or habits disturbing the central nervous system [1]. Specifically, polymorphisms in DRD2 relate with bruxism phenotypes in children [4] is a genetic

Abbreviations: SB, Sleep Bruxism; DRD2, Dopamine receptor D2; CSHQ, Children's Sleep Habits Questionnaire; HBSC-FFQ, Health Behaviour in School-Aged Children Food-Frequency Questionnaire; WHO, World Health Organization; QoL, Quality of Life.

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https://doi.org/10.1016/j.sleepx.2021.100035

variation in the dopamine receptor D2 (DRD2) that may alter dopamine signaling and modify the rewarding effects of food [5] and videogame playing [6]. The consumptions of added sugar and excessive screen-time is increasing worldwide [7–11], rising sleep and behavior disorders [5,10,12,13], which have been also associated with SB in children [14–18]. Despite the evidence, there are no studies evaluating the association between SB and screen-time and added sugar consumption in children. Thus, the objective of this investigation was to examine the relationship between possible SB and screen-time and added sugar consumption in children and aimed to explore the hypothesis that exceeded sugar consumption and screen-time is associated with increase-to-increase possible SB in children.

2. Materials and methods

2.1. Design

A descriptive cross-sectional study was carried out. Four-hundred sixty 4-8 year-old children were included. Subjects were selected from 12,320 students enrolled in private and public schools in Medellín, according to the Colombian National Administrative Department of Statistics (DANE).

2.2. Ethics approval

The study was approved by the ethics committee of Universidad CES (file 133–44-1). Parents signed the written informed consent.

2.3. Population and sample

The urban area of Medellín is divided into 16 communes. The sample was stratified by commune and type of educational institution (public and private). Educational institutions were randomly selected. Afterwards, the same number of girls and boys were assigned at random to each age group using a computerized procedure.

Sample size was calculated based on a margin of error of 5% and a confidence level of 95%. A 40% prevalence rate of possible SB [2] was considered as the estimated percentage to increase potency. Sixteen of the 124 public and fourteen of the 86 private educational institutions were randomly selected. The sample size was estimated at 367 children, to which an additional 20% was added to compensate for possible dropouts, for a total of 460 children. Data were collected from January to October 2018. The flowgram of sample selection is presented in Fig. 1. Children with neurological disorders like cerebral palsy or Down syndrome and/or breathing disorders related by parents were excluded.

2.4. Assessment of possible SB

Evaluation of possible SB was assessed with the spanish version [19] of the Children's Sleep Habits Questionnaire (CSHQ) [20]. The CSHQ is a retrospective questionnaire, which recalls the child's sleep behaviors over a “typical” recent week. The question “How frequently does your child grind/gnash the teeth during sleep?” was answered by parents and it had three possible answers rated on a three-point frequency Likert scale: 1 = “Rarely” if the sleep item occurs 0 or 1 time per week; 2 = “Sometimes” for 2 to 4 times per week; and 3 = “Usually” for 5 to 7 times per week.

2.5. Evaluation of added sugar consumption

Added sugar consumption was investigated by means of the Health Behaviour in School-Aged Children Food-Frequency Questionnaire (HBSC-FFQ). The HBSC-FFQ is a 15-item module included within the HBSC questionnaire [21]. The question, “How many times a week do you usually eat/drink … ?” was followed by the following list of food and beverage items containing added sugar: cereals (corn flakes, choco pops, muesli, etc.), milk products (eg yoghurt, quark, chocolate milk, fristi, puddings, etc.), and items relevant to youth food culture (crisps, chips, sweets and chocolates, soft drinks, diet soft drinks). Additionally, addition of sugar to juices or beverages were also asked. The answers were given by the parents in a Likert-type scale.

2.6. Screen-time

The range of time children spent using screens (cell phones, computers, electronic devices, electronic games, TV or other screen-based devices with recreational, not academic purpose) was reported daily by parents on weekdays and weekend days for a week [22]. The average of weekday and weekend screen time was calculated to yield screen-time use in hours/week. The time was recorded in hour/day and the mean of screen-time was obtained for week and week-end days. Screen-time was log-transformed for analysis and analyzed as a continuous variable.

2.7. Statistical analysis

All data were analyzed with STATA© data analysis and statistical software version 13.0 (Copyright 1996–2016; Stata-Corp LP, College Station, TX, USA). Subjects whose data were not complete, were all excluded from analysis.

Spearman correlation test was used to find the association between SB, added sugar consumption and screen-time. An ordinal-multiple-variable logistic regression analyses was used to determine the association between the frequency of added sugar

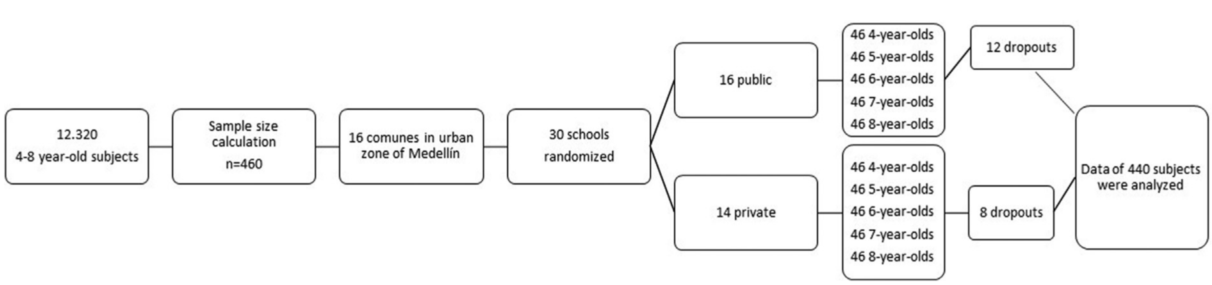

Fig. 1. Flowgram for the selection of subjects.

Table 1
Demographic and descriptive data.

	Sleep Bruxism			
	Never-Rarely (0–1 night)	Sometimes (2–4 nights)	Usually (5–7 nights)	Total
Gender (n, %)				
Masculine	126 (28.62)	56 (12.72)	42 (9.54)	224 (50.9)
Femenine	160 (36.36)	37 (8.41)	19 (4.31)	216 (49.09)
Age (Mean in years; SD)	6.92 (1.20)	6.43 (1.41)	5,20 (1.92)	6.2 (1.80)
Children in each type of educational system (n, %)				
Public	135 (30.61)	51 (11.59)	32 (7.27)	218 (49.54)
Private	154 (35.0)	42 (9.54)	26 (5.90)	222 (50.45)

consumption and screen-time and the frequency of possible SB. The odds ratio and ordinal odds ratio were used as relative measures of effect. A 95% confidence interval was considered and p-value was considered statistically significant at 0.05.

3. Results

Twenty parents did not fill all instruments correctly. Thus, 440 subjects [Mean age 6.2 years (S.D. 1.8), 44 girls and 44 boys for each age] were finally included for data analysis (218 from public schools and 222 from private schools).

There were more children, whose parents reported possible SB (sometimes and usually) in public than in private schools. The demographic and descriptive information is included in Table 1. Prevalence of possible SB was higher in males than in females. Parents reported 35% of the children with frequencies "Sometimes" and "Usually" possible SB. The percentages of children who experienced "Usually" possible SB, were fewer than those who experienced it "Sometimes". Children with the highest frequency of possible SB were younger (mean age 5.20 years) than those whose parents reported SB 2–4 nights a week (Table 1).

Parents reported 73% of the children ($n = 319$) to consume food containing added sugar once a day every day and 20% more than once every day. Only 5.4% consumed foods with added sugar once or less a week. Children studying in the public system (from low-income families) consumed more added sugar ($n = 180$) than children studying in private schools ($n = 139$).

Screen-time was available for 92.2% (406/440) of the children. Mean screen-time was 2.43 h/day (1.91 h per day during weekdays and 2.96 during weekends) and was higher for children from private schools (index = 2.38 h) than for children from public schools (index = 1.78 h), even when children from public schools watched more television (mean 0.75 h SD 0.35 h) than children in the private schools (0.38 h SD 0.12).

Possible SB was statistically significant correlated with added sugar consumption (Rho = 0.7; $p = 0.03$) and with screen-time (Rho = 0.8; $p = 0.002$) (Table 2). Statistical and clinical significant associations were found between SB and the increase-to-increase screen-time and between possible SB and increase-to-increase added sugar consumption (OR > 2) (Table 3).

4. Discussion

The present study aimed to examine the relationship between possible SB and screen-time and added sugar consumption in children. Excessive consumption of added sugar and screen-time, are common behaviors today in children [7,23]. Added sugar and screen-time affects Dopamine neurotransmission [4,5], that is also involved in possible SB etiology [24]. That is why the objective of this investigation was to examine the relationship between possible SB and screen-time and added sugar consumption in children. The main results were: 1) Seventy-three percent of the children consumed food containing added sugar once a day every day and 20% more than once every day. Children from public schools consumed more added sugar than children from private schools; 2) Screen-time was available for 92.2% of children. Mean screen-time was 2.43 h/day and was higher for children from private schools than for children from public schools; and 3) Statistical significant associations were found between SB and the increase-to-increase screen-time and increase-to-increase added sugar consumption.

Alterations in quality of life (QoL), have been associated with SB in children; particularly, affection of school function (working memory) and emotional function (feeling sad) [25]. Excessive screen-time and added sugar consumption are risk factors for the same QoL issues [26–30]. Previous investigations demonstrated the relationship between television and/or total screen-time viewing and adverse dietary habits [31], but this is the first study to our knowledge, to search for the association between possible SB and screen-time and added sugar consumption.

Among the factors related to QoL, overuse of screen-time and added sugar consumption leads to alterations in sleep [32–35], lack of cortisol homeostasis [36,37], depression [11,38], hostility and Attention Deficit Hyperactivity Disorders related symptoms [12], among others. All these factors are related to SB [13–16] and in this study it was demonstrated the high association between excessive screen-time and added sugar consumption with SB in children.

Table 2
Correlation between screen-time and sugar consumption with possible sleep bruxism. Spearman correlation (Rho and p values).

	Sleep Bruxism			Rho	p value
	Never-Rarely (0–1 nights)	Sometimes (2–4 nights)	Usually (5–7 nights)		
Sugar consumption (n/%)					
Never	0	0	0	0.7	0.03
Less than once a week	10 (2.27)	1 (0.22)	1 (0.22)		
1 day/week	4 (0.90)	2 (0.45)	6 (1.36)		
2–4 days a week	2 (0.45)	1 (0.22)	1 (0.22)		
5–6 days/week	2 (0.45)	1 (0.22)	2 (0.45)		
Once a day	65 (14.77)	183 (41.59)	71 (16.13)		
More than once a day	6 (1.36)	36 (8.18)	46 (10.45)		
Screen-time (Hours per day/SD)					
Weekdays	1.18 (1.31)	1.38 (0.45)	3.35 (1.62)	0.8	0.002
Weekend days	1.30 (1.23)	3.35 (1.24)	4.23 (1.26)		
Screen-time index	1.15 (1.03)	2.36 (1.89)	3.79 (1.85)		

Table 3
Association of screen-time and sugar consumption with possible sleep bruxism. Ordinal multiple-variable analysis.

Dependent variable	Independent variables	OR	p value	IC	Influence of the model on the frequency of sleep bruxism	Ordinal OR	p value	CI
Sleep bruxism	Screen-time	3.2	0.001	1.8–4.1	1[a] vs 0[a]	7.17	0.001	5.08–11.26
					2[a] vs 0[a]	8.18	0.02	6.91–12.11
	Sugar consumption	2.5	0.004	1.3–3.2	1[a] vs 0[a]	3.62	0.07	0.77–6.46
					2[a] vs 0[a]	5.31	0.04	2.31–8.31

[a] 0 Rarely 1 Sometimes 2 Usually possible sleep bruxism.

In Colombia, families of children studying at schools from the private system, have better economic situation than children assisting to public schools, which represent 80% of the population [39]. In developing countries, such as Colombia, children with the highest socio-economic status trend to be most sedentary and have screen-time over the guidelines of WHO and the American Academy of Pediatrics (>2 h/day) [40]. However, viewing television before going to sleep, is more frequent in children coming from low-income families [41]. These two conditions are supported by the results derived from this study with a population design. Additionally, this investigation found SB to be more prevalent in children from public schools than from private schools, which is also supported by the findings of previous studies [42]. These correlations could lead to think on the possibility of considering SB as an indicator of alterations in living habits (specifically dietary and the use of screen time) that could affect sleep quality, and cognitive and behavior performance.

Despite efforts were made to maximize the internal (ie, use of a validated questionnaire, as the best available strategy to collect bruxism-related data for epidemiological purposes) and external (ie, selection of a large population of children representative of the city of Medellín; reproducible study design) validity of the study, generalization of findings is limited by the absence of a definite SB diagnosis. Limited availability, high economical costs, complex technical equipment as well as the unfamiliar laboratory setting, difficulties to use it and lack of valid data in children [43], are limits to the use of polysomnography for routine purposes. Additionally, the design of this study does not allow determining causality. Notwithstanding the limitations, the results of this study come from a population design. It is important to take them into account when designing public policies to favor the construction of healthy habits at home and in the educational system, as a way to improve children's health.

5. Conclusion

Strong correlation of screen-time and added sugar consumption with possible SB was demonstrated. Screen-time and added sugar consumption represent risk factors in terms of increase-to-increase frequency of possible SB.

Funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data sharing statement

Individual participant data (including data dictionaries) will be made available, in addition to study protocols, the statistical analysis plan, and the informed consent form. The data will be made available upon publication to researchers who provide a methodologically sound proposal for use in achieving the goals of the approved proposal. Proposals should be submitted to crestrepos@ces.edu.co.

Acknowledgement

The authors acknowledge the participation of the undergraduate students of the Faculty of Dentistry of Universidad CES for the collection of data.

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.2021.100035.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sleepx.2021.100035.

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