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SLEEP, EATING HABITS AND SOCIOECONOMIC CHANGES IN CHILDREN: EFFECTS OF THE COVID-19 PANDEMIC

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ABSTRACT

The current pandemic scenario has brought consequences for the health of the child population, including changes in sleep and eating behavior. The present study aimed to evaluate changes in sleep, eating habits and socioeconomic status during the pandemic outbreak. A longitudinal study with 37 children between 4-10 years old from a public school. Sleep habits were evaluated through the Questionnaire of Sleep Habits for Children (QSTC), food ingestion, through the 24-hour Recall, and collected socioeconomic data. There was an increase in total sleep time ($p<0.01$) and a decrease in the overall sleep quality ($p<0.01$). A reduction in the number of meals consumed was observed ($p<0.01$). Higher consumption of ultraprocessed food was observed in relation to in natura, with no changes after pandemic. A socioeconomic decline was observed in 43.2% of families ($p<0.01$). Improvements in children's sleep quality and duration, a reduction in the number of meals per day and the loss of access to school meals was observed.

Key words: SARS-COV-2. Eating habits. Sleep. Preschool.

RESUMO

Sono, hábito alimentar e alterações socioeconômicas no público infantil: efeitos da pandemia de covid-19

O atual cenário de pandemia trouxe consequências para a saúde da população infantil, incluindo alterações no sono e comportamento alimentar. O presente estudo teve como objetivo avaliar as mudanças no sono, hábitos alimentares e estado socioeconômico durante a pandemia. Estudo longitudinal com 37 crianças entre 4-10 anos de idade de uma escola pública. Os hábitos de sono foram avaliados através do Questionário de Hábitos de Sono para Crianças (QSTC), a ingestão alimentar foi avaliada através do Recordatório de 24 horas, e os dados socioeconômicos foram coletados para caracterização da amostra. Foi observado um aumento no tempo total de sono ($p<0,01$) e uma diminuição da qualidade geral do sono ($p<0,01$). Houve uma redução no número de refeições consumidas ($p<0,01$). Observou-se maior consumo de alimentos ultraprocessados em relação aos in natura, sem alterações após a pandemia. Além disso, foi observado um declínio socioeconômico em 43,2% das famílias ($p<0,01$). Observou-se melhora na qualidade e duração do sono das crianças, redução no número de refeições por dia e perda de acesso à merenda escolar.

Palavras-chave: SARS-COV-2. Hábito alimentar. Sono. Pré-escolar.

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INTRODUCTION

The spread and infection of the SARS-CoV-2 virus, which causes COVID-19, reached pandemic proportions in the first quarter of 2020.

Due to the high rate of transmissibility of this virus, social isolation measures were imposed as a way to control the evolution of the disease, which led to changes in the lifestyle of the population (WHO, 2020).

This adoption of a new lifestyle culminated in the suspension of face-to-face school activities and a longer time spent in the home environment for the child population (Brasil, 2020).

These changes directly affect health conditions, resulting in changes in eating habits, changes in physical activity patterns and the loss of access to school meals. In this sense, studies suggest that these changes may cause an increase in food consumption and worsen the quality of consumed food, mainly due to higher consumption of ultra-processed foods, in addition to a decrease in the time spent participating in active activities (Ruíz-Roso and collaborators, 2020).

Sleep quality could also have been modified due to new routines imposed by the pandemic. Social isolation promoted increased stress and anxiety and decreased exposure to daylight for the population, factors that can affect the circadian rhythm (Morin and collaborators, 2020).

In addition, in the child population, the suspension of school classes also contributed to changes in sleep due to the loss of synchronized waking and sleeping routines, with a greater propensity to increase total sleep time (Dragun and collaborators, 2021).

A sufficient quantity and quality of sleep is extremely important for the general population, including the child population, as they influence factors such as attention, cognitive function, emotional regulation and physical health (Paruthi and collaborators, 2016).

Thus, in view of the current pandemic scenario and health consequences, it is necessary to know the impacts of pandemic containment on the health habits, including sleep and eating behavior, of the child population to develop strategies to prevent possible damage caused during this period.

Therefore, the present study aimed to analyze changes in the sleep and feeding habits of children caused by the COVID-19 pandemic.

MATERIALS AND METHODS

The longitudinal study was composed of a convenience sample of children between 4 and 10 years old who were public school students in a municipality in southern Minas Gerais. The parents or guardians of the students who agreed to participate in the research answered the questionnaires. The study was approved by the ethics committee on research with human beings of the Federal University of Lavras (opinion: 4.285.5229).

Data collection occurred at two main time points: in February 2020, before the social distancing measures were imposed due to the COVID-19 pandemic, through in-person interviews with parents or guardians, and in October 2020, after the social distancing measures were imposed, through telephone interviews with the previously interviewed participants. The same data were collected at both time points.

Data were collected through a socioeconomic questionnaire, including information such as marital status, schooling, and family income.

At the second moment of the study, data on changes in monthly income during the pandemic and the receipt of some government aid were collected.

The social class was defined for the two time points of the study according to the criteria of the Brazilian Institute of Geography and Statistics (IBGE) and was based on the family's gross monthly income, measured in minimum wages and classified as follows: Social class A (> 20 minimum wages), B (10-29 minimum wages), C (4-10 minimum wages), D (2-4 minimum wages) and E (up to 2 minimum wages) (Rosa and and collaborators, [2014?]). Per capita income was calculated based on the reported gross monthly income divided by the number of residents in the home.

Anthropometric measurements were objectively collected at the school, only at the first study time point. Weight and height measurements were measured following the protocol of the technical standard of the Food and Nutritional Surveillance System (SISVAN). Only one waist circumference measurement was measured for central fat classification (Taylor and collaborators, 2000).

Weight and height measurements were evaluated using anthropometric indices for weight for age, height for age and Body Mass Index (BMI) according to the recommendations of the World Health Organization (WHO, 2006; WHO, 2007).

The Children's Sleep Habits Questionnaire validated for Portuguese (QSTC-PT) was used to assess the sleep quality of the population at the two study timepoints. This questionnaire consists of five components ("Bedtime"; "Behavior during sleep"; "Waking up at night"; "Waking up in the morning" and "Drowsiness during the day") and is scored using a three-point scale: usually (5 to 7 times a week), sometimes (2 to 4 times a week) and rarely (once or never). By summing the responses, a total score is designated for each participant, and the overall mean is determined for the studied population. The cutoff point used to indicate the possibility of sleep disorders in children is 47 points (Silva and collaborators, 2014). In addition, the difference between bedtime and waking before and during the pandemic was calculated.

For the analysis of food consumption, a 24-hour recall (R24h) was used to determine food consumption on the previous day, completed by parents or guardians at the two study timepoints and conducted by a trained team. Homemade measures of the R24h were developed using grams based on the Table for Evaluation of Food Consumption in Home Measures (Pinheiro and collaborators, 2005) and on the Table of Measures Referred to For Food Consumed in Brazil (IBGE, 2020).

The calculation of energy and macro- and micronutrient consumption was made by Dietsmart® software using the Brazilian Table of Food Composition (NEPA, 2011), Table of Chemical Composition of Foods (USDA, 2008), and the Food Composition Table: Support for nutritional decision (Philippi, 2013). The intake of these nutrients was analyzed following the recommendations of the acceptable macronutrient distribution range (AMDR), and for micronutrients, the estimated mean need (RAS) was used for the age group (Padovani and collaborators, 2006; Institute of Medicine - IOM, 2011).

The frequency of daily consumption of the groups of fresh/minimally processed, processed and ultra-processed foods was also determined (Brasil, 2014).

The menu offered at the school before the pandemic was also evaluated based on the Method of Qualitative Evaluation of Menu Preparations (AQPC), which uses the quality criteria for menu analysis (Veiros e Proença, 2003).

The frequency and percentage in which these items were found on the menu was determined and separated into both positive and negative aspects (Prado and collaborators, 2013).

The caloric average of the menu offered was based on the daily calorie information provided on the menu itself, prepared by the municipal nutritionists responsible for the development of the menu. Continuous variables were investigated for normality (Kolmogorov-Smirnov test). Descriptive analyses of the frequency, mean and standard deviation were performed. For comparisons of continuous variables, the paired Student's t test and a simple Spearman correlation test was used for dependent samples.

The associations between the categorical feeding variables were analyzed by chi-square and McNeman tests. The software used was SPSS Statistics®. A significance level of $p<0.05$ was adopted.

RESULTS

In the initial evaluation, 110 parents or guardians were invited to participate; however, only 60 returned the initial contact.

Of these, there were two losses due to withdrawal, and some of the participants had missing data, totaling 46 participants with all data collected. In the second phase of the study, during the period of social distancing, 7 participants refused to continue participating in the study, and 2 were not contacted, remaining 37 participants in the study.

Thus, the study sample consisted of 37 children from a public elementary school in a municipality in southern Minas Gerais; 62.2% of the sample was male, with a mean age of 7.38 ± 1.15 years. Regarding nutritional status, 65.4% of the children were classified as eutrophic, according to the classification of the anthropometric BMI/age index (Table 1).

Regarding the economic data analyzed during the period of social distancing, there were no significant changes in per capita income and gross monthly family income; however, there was a decline in the social stratum of individuals from class C to class D,

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with an increase from 16.7% to 23.5% in the number of people included in class D and from 66.7% to 70.6% in the number of individuals included in class E (Table 2).

There was also a positive correlation between gross monthly income during the pandemic and sex (p<0.001) and the age of the parents or guardians (p<0.001), while per capita income showed a positive correlation with the frequency of consumption of ultra-processed foods during the pandemic (p<0.001

Table 1 - Sociodemographic characteristics and nutritional status of children from a public school in Lavras-MG.

Variables	Average ÷ Standard Deviation	n (%)
Children's age (n=37)	7.38 ± 1.15	
Elementary School Series (n=37)		
1º - 2º Stage		2 (5.4)
1º - 2º year		13 (35.2)
3º - 4º year		15 (40.5)
5º year		7 (18.9)
Gender (n=37)		
Female		14 (37.8)
Male		23 (62.2)
Weight/Age Index Classification [a] (n=26)		
Low		0
Adequate		21 (91.3)
Elevated		2 (8.7)
Height/Age Index Classification [b] (n=26)		
Short stature		0
Adequate		26 (100)
BMI/age index classification [b] (n=26)		
Low weight		0
Eutrofia		17 (65.4)
Overweight		5 (19.2)
Obesity		4 (15.4)

Note: [a]Three children did not have the weight/age rating because they were 10 years and 2 months at the time of collection; [b]Nutritional status data could not be collected from all individuals due to suspension of school classes.

Table 2 - Economic characteristics of the population studied before and during the Covid-19 pandemic

Variables	Before	During	p-value
Monthly income (R$)*	1883.57 ± 1619.23	1843.57 ± 1506.98	0.798
Yield per capita (R$)*	383.88 ± 247.05	412.67 ± 230.44	0.453
Social class **			
Class C	16.7%	5.9%	
Class D	16.7%	23.5%	0.001***
Class E	66.7%	70.6%	

Note: *Paired T-test **Chi-square test ***p-value<0.01.

During the pandemic, a significant increase in total sleep time in minutes, and a delay in bedtime and waking of 38.38 ± 86.08 min and 104.19 ± 141.73 min, respectively, was observed, thus representing a delay of approximately 1.7 hours in the time of awakening and approximately 40 minutes in bedtime. Regarding the total sleep time, the means were 8.8 hours and 10.1 hours before and during the pandemic, respectively. When analyzing the overall mean score of the questionnaire before and during the pandemic, a significant reduction was observed, where lower values representing an improvement in sleep quality. When analyzed separately, the questionnaire subscales showed a significant reduction in the components "difficulty waking

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up in the morning" and "sleepiness during the day" (Table 3).

Regarding the food consumption of the population studied, in the pre-pandemic period, it was observed that 78.4% of the children had consumed the meal offered by the school (Figure 1).

During the pandemic, there was a drop in the number of meals eaten by children throughout the day (Figure 2). No other significant changes were observed in relation to food intake in the quantitative and semi quantitative evaluations performed.

Table 3 - Comparison of sleep duration and quality before and during the covid-19 pandemic.

Variables	Before	During	p-value
Total sleep time (min)*	529.72 ±80.089	607.70 ±84.045	0.000***
QSTC score *	50.58±7.264	46.83±6.789	0.007***
Resistance to going to bed*	13.44±3.229	12.78±3.407	0.201
Behavior during sleep*	20.78±3.658	20.72±3.614	0.927
Waking up at night*	2.61±0.688	2.53±0.810	0.539
Difficulty waking up in the morning*	8.81±3.214	7.06±2.242	0.002***
Daytime sleepiness*	4.58±1.442	3.75±1.025	0.004***
Sleep quality**			
Good (%)	38.9%	50%	0.344
Bad (%)	61.1%	50%	

Note: n=36; *Paired T-test **McNemar test ***p-value<0.01.

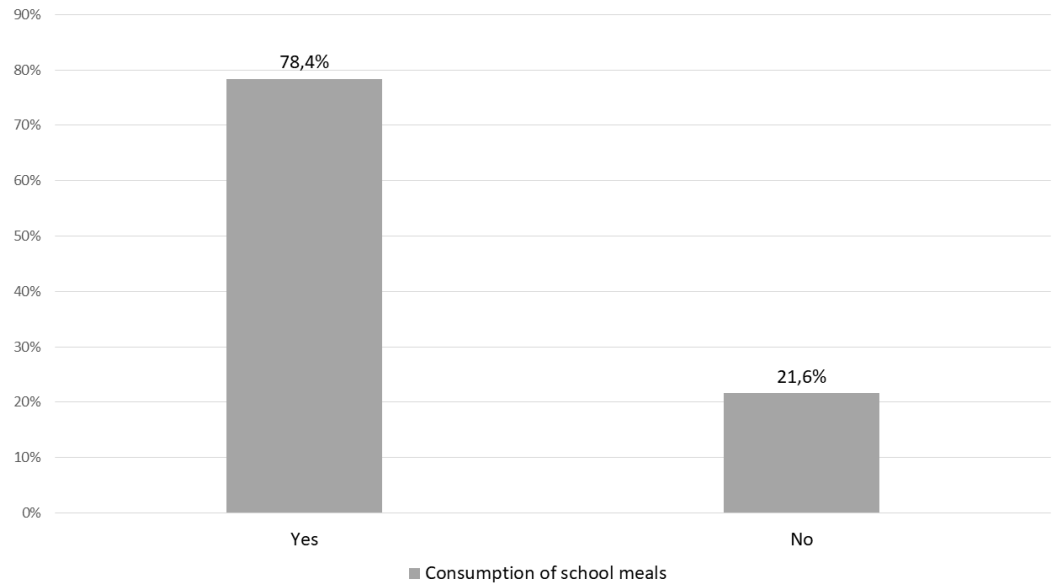

Figure 1 - Consumption of school meals before the pandemic.

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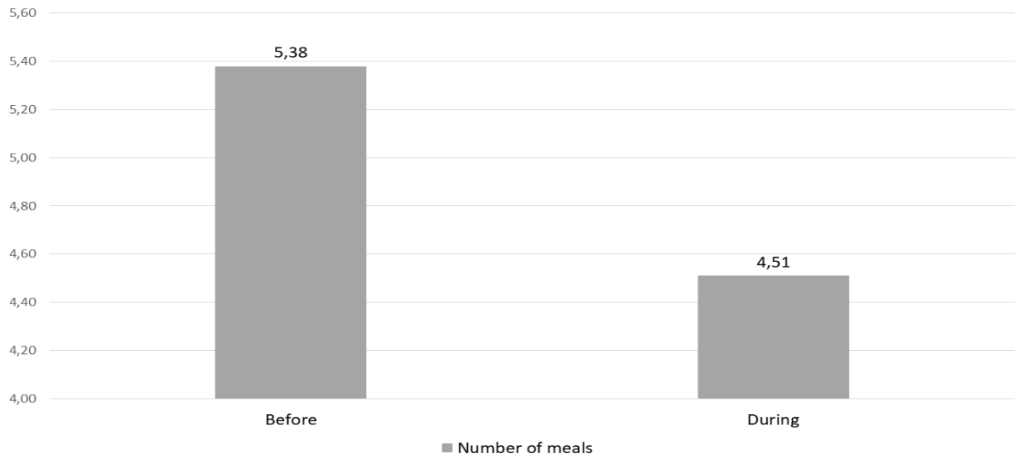

Figure 2 - Quantitative analysis of food intake the children's before and during the Covid-19 pandemic. (Paired t-test; p-value<0.01).

The adequacy of the school feeding menu was analyzed. Fruits and sweets were not commonly offered in the school, and this absence was considered lousy and very god, respectively (Table 4).

Table 4 - School menus analysis before the Covid-19 pandemic.

Items analyzed from the menu	Weekly menu		Classification
	N	Percentage (%)	
Vegetables	5	20	Lousy
Leafy Vegetables	8	32	Bad
Monotony of colors	14	56	Bad
Sulfur	14	56	Bad
Fatty meats	5	20	Good
Trans fatty acid	4	16	Good
Fruits	0	0	Lousy
Candy	0	0	Very good
Calories (average)	363.62 ± 81.21	-	-
Total school days	25	100	-

Note: Analysis made using the Method of Qualitative Evaluation of Menu Preparations (AQPC).

Food intake was also analyzed for the quality of meals; for this, the consumption of food groups (industrialized foods, fruits, vegetables, beans, meats and milk and dairy products) and breakfast was considered. There was no statistically significant change in the qualitative analysis of meals.

In relation to the consumption of ultra-processed foods, there was an increase of approximately 5% in the consumption of stuffed biscuits, sweetened beverages and frozen cold potatoes. On the other hand, the consumption of foods such as packet snacks and instant noodles were not reported during this period, being observed only in the period before social distancing.

All macronutrients were within the AMDR recommendation range, while the micronutrients, on the other hand, only calcium intake did not reach the recommended average for the population in question at both study time points, presenting a no significant decline in the average intake during the pandemic.

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DISCUSSION

The COVID-19 pandemic resulted in several impacts on the health of the population (Paruthi and collaborators, 2016; Morin and collaborators, 2020; Ruíz-Roso and collaborators, 2020; Dragun and collaborators, 2021).

The main findings of the present study were the positive effects of social distancing measures on children's sleep quality, the loss of the energy contribution of school meals to food consumption, and the negative impact on family income. Also, we were not able to observe important impacts on eating practices in this population during the pandemic time.

Our results demonstrate a significant increase of approximately two hours in the total sleep time of the children, in addition with an improvement in overall sleep quality. In addition, the time to wake up and sleep was delayed, which showed that waking up later compensated for going to bed later.

Regarding the average total sleep time before and during the pandemic, only the timepoint during the pandemic can be classified as sufficient, since the recommendations for the number of sleep hours for preschoolers (3-5 years) and for schoolchildren (6-13 years) are 9 to 13 hours of sleep (Moore and collaborators, 2020; Bryan e Peters, 2024).

In a study conducted with Croatian students, an average increase of 1.5 hours in sleep duration during the COVID-19 pandemic was observed (Dragun and collaborators, 2021).

In Brazil, a study suggested that there was an increase in sleep time reported in the child population during this phase (López-Gil and collaborators, 2021).

These authors believed that increased sleep time during the pandemic was a way to compensate for the lack of sleep during school days, as well as representing a response to the lack of a regular routine triggered by the pandemic (Baptista and collaborators, 2021; Dragun and collaborators, 2021).

However, few studies have been developed in the Brazilian child population (Baptista and collaborators, 2021; López-Gil and collaborators, 2021).

The Brazilian Sleep Association (ABS) suggests that the school hours of most Brazilian schools are inadequate and cause sleep impairments, which can have negative consequences for mood and school performance (ABS, 2021).

At the school studied in the present research, the start time of school activities was seven o'clock in the morning. According to the recommendations of the ABS, the recommended start time for school activities is 8:30 am to ensure sleep quality and a good learning process; sleep restriction reduces attention and readiness for learning due to drowsiness at the time of study, in addition to affecting the process of memory consolidation that occurs during the sleep period, compromising the solidification of the information learned (ABS, 2021).

Regarding the sleep quality classification, there was a no significant reduction in QSTC score values, indicating an improvement in sleep quality during the pandemic.

Similar values were found in the validation study of the questionnaire, where children identified by their parents as "having trouble sleeping" had an average score of 54.5, similar to the average score of this study population before the pandemic; the average score of children "without problems sleeping" was 45.9, similar to the score during the pandemic (Silva and collaborators, 2014).

The subscales corresponding to "difficulty waking up in the morning" and "daytime sleepiness" showed significant decreases, suggesting improvement of these parameters during the pandemic.

Dragun and collaborators (2021) showed a significant reduction in the number of students who reported feeling extremely tired and sleepy after waking up during the pandemic, which is a reflection of the increase in sleep duration.

Regarding food intake, no significant changes were observed either quantitatively or qualitatively. Although we did not observe changes in the caloric intake of the children, it is important to highlight that in the period before the pandemic, the caloric values of the diet were underestimated in our study because it was not possible to account for the caloric contribution of school meals in the feeding of children; this observed increase in caloric intake during the pandemic was not representative of the actual quantitative situation of the population's diet.

The caloric value of the meals offered by the school was approximately 300 kcal, so we can suggest that there was an approximate reduction of 300 kcal/day in the caloric intake of

these children due to the loss of this meal. This finding may have an important impact on ensuring the food security of this population in the future.

Although the qualitative analysis of school feeding has mostly presented unsatisfactory indices, the average caloric value offered is a strong contributor to meet the recommended needs for children.

In addition, there was a significant reduction in the number of meals consumed per day, suggesting that this reduction was due to the withdrawal of school meals from these individuals' routines.

Another concern regarding the pandemic period is in relation to the guarantee of attendance of energy and nutrients needs of children, due to changes in the population's economic status, especially in the population with social vulnerability. In the present study, most individuals reported having suffered some change in monthly income due to the COVID-19 pandemic, with an increase in the population in the lower social classes during this period. Changes in family income can be particularly important in low-income families and contribute to the increase in food insecurity.

Similar changes in income were found in a study conducted with Italian individuals, where 40% of respondents reported that the domestic economy somehow worsened during the pandemic; thus, the concern about lack of food increased significantly (Dondi and collaborators, 2021).

Data from the National Survey on Food Insecurity in the Context of the COVID-19 Pandemic in Brazil (VIGISAN) revealed that in the Brazilian population, 40.1% of the individuals who reported having a reduction in household income during the pandemic were classified as having mild food insecurity, which means that there was concern about the lack of food in the future, in addition to an increase in the consumption of foods with inadequate quality as a way to not affect the amount of food present in the home (Rede PENSSAN, 2021).

Although 56.8% of the participants in this study reported receiving emergency assistance from the government, the VIGISAN showed that this resource was not enough to reduce the food insecurity of families. The study showed a high degree of moderate/severe food insecurity (28%) in households with people who requested and received emergency aid (Rede PENSSAN, 2021).

The risk of food insecurity in these families may be aggravated due to the suspension of school classes, since school plays an important role in the nutrition and food safety of the child population (Alvi and collaborators, 2020).

In the present study, before declaring a COVID-19 pandemic, 78.4% of the participants stated that their child had consumed school meals the last day. In the case of low-income families, the meals offered at school act more as substitutes than in a complementary way, thus helping to reduce endemic hunger worldwide (Alvi and collaborators, 2020; Mayurasakorn and collaborators, 2020).

However, the present study presented some limitations, such as the sample loss during the development of the work, which impaired the size of the final sample, and the use of the R24h resource to collect food data in the child population, in which reports should be made by parents or guardians, who generally cannot accurately report consumption in the school environment.

However, the present study, because of its longitudinal nature, demonstrates the effects of the COVID-19 pandemic on the health habits of this population.

CONCLUSION

We can conclude that during the social restrictions imposed by the pandemic of COVID-19 children had more time to sleep, without changes in overall sleep quality.

There were no changes in the diet of the population in question regardless of the loss of the school meal during this time.

Also, changes in family income were reported, and a decline in population strata was observed.

These impacts can be harmful in the long term, since habits that are formed in this phase of life can have repercussions throughout adult life. Additionally, the risk of food insecurity in the population resulting from the COVID-19 pandemic should be studied.

CONFLICT OF INTEREST

All authors declare that they have no conflicts of interest.

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