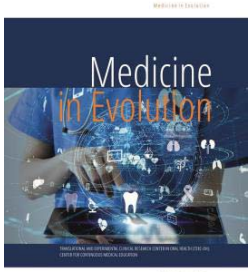
Relationship between Screen Time and Sugar Consumption - a Predictor for Children´s Oral Health



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Received: 4 December 2024; Accepted: 17 December 2024; Published: 30 December 2024

Abstract

The impact of screen time on children's health is a growing concern, particularly with regard to its association with dietary habits and oral health. This cross-sectional study investigates the relationship between daily recreational screen time and the consumption of cariogenic foods, including sweets, soft drinks, fast food, and snacks, among Romanian children aged 1 to 6 years. A total of 121 children were enrolled, but after applying inclusion and exclusion criteria, 74 participants (39 boys and 35 girls) were included in the final analysis. Parents provided data on their children's screen time and dietary habits through a structured questionnaire. Results indicated a significant correlation between increased screen time and higher consumption of sugary snacks and beverages, contributing to the risk of dental caries. This study highlights the need for early interventions to promote healthy screen time and eating behaviors to improve children's oral health outcomes.

Keywords: Toddler, Oral Health, Screen-time, Food Habits, Added sugar

INTRODUCTION

The triple burden of malnutrition, comprising undernutrition, hidden hunger, and overweight, poses a serious threat to children's growth and development. While the prevalence of infant undernutrition has notably decreased, there has been a rapid increase in cases of overweight and obesity [1]. This suggests that malnutrition has emerged as the primary nutritional concern for children worldwide. The toddler stage (1-3 years) is crucial for shaping eating habits and food preferences [2]. The nutritional well-being of infants and toddlers can profoundly influence long-term health outcomes [3]. Following a nutritious diet can significantly mitigate the risk of malnutrition [4].

Childhood overweight and obesity represent significant global public health concerns at present. In 2019, approximately 38 million children under the age of 5, and in 2016, over 340 million children and adolescents aged 5–19 years were affected by overweight or obesity worldwide [5]. In Europe, during the period spanning 2016 to 2017, the statistics remained equally concerning. The prevalence of overweight and obesity among children aged 6 to 9 years ranged from 10% to 21%, with the highest rates observed in Southern European nations [6]. It is crucial to note that obese children are at a higher risk of experiencing health complications both during their childhood and later in adulthood [7-9].

Childhood overweight and obesity stem from a blend of genetic, behavioral, and environmental influences [9]. These factors lead to an energy imbalance where calorie intake exceeds calorie expenditure [10]. The nutritional quality of children's diets is influenced by various factors, including gender, geographical location, parental education levels, socioeconomic status (SES), levels of physical activity, and duration of sleep [11,12]. Furthermore, children's screen time has experienced a significant surge during the COVID-19 pandemic [13]. In recent decades, the widespread availability of various electronic media devices worldwide has brought attention to the complexity of recreational screen time. While television (TV) viewing remains prevalent among schoolchildren, activities such as video gaming, computer (PC) use, and ownership of devices like tablets and smartphones have become ingrained in daily life from an increasingly young age.

Nonetheless, there is a growing concern regarding the impact of screen time on the health of children and adolescents [14]. The screen time observed in children and adolescents is linked to negative health outcomes and physiological effects, such as diminished physical fitness and adverse impacts on both psychosocial and physical well-being [15]. The American Academy of Pediatrics advises that children and adolescents should limit their screen time to no more than 2 hours per day [16].

Excessive screen time often correlates with poor dietary choices, including the consumption of high-fat, high-sugar foods and beverages, while decreasing intake of fruits and vegetables. These dietary patterns, coupled with metabolic disorders, can contribute to a higher incidence of dental caries and increased plaque accumulation. Moreover, the sedentary lifestyle associated with excessive screen viewing may impact oral health behaviors such as frequency of tooth brushing, regular dental check-ups, and overall oral hygiene practices [17].

The duration spent on screens could influence snacking behavior through various channels, including increased parental working hours leading to reduced supervision time, overlooking the negative impacts of poor dietary choices, and resorting to convenient options like mobile devices for entertainment and junk food for quick feeding [18,19].

Oral health issues represent substantial concerns that not only affect the dental well-being of children but also influence their psychosocial welfare, encompassing dental discomfort, anxiety, and absenteeism from school. These consequences extend beyond impacting individuals and families, potentially leading to increased stress and strain on

healthcare resources required for treatment provision [20]. Dental caries, classified by the World Health Organization as a significant global public health issue and the most prevalent non-communicable ailment, shares common risk factors like diet with other conditions such as obesity [21].

Aim and objectives

Hence, the aim of this study is to examine the association between daily recreational screen time and the consumption frequency of sweets, soft drinks, fast food, and snacks among a group of Romanian children aged 1 to 6 years.

MATERIAL AND METHODS

1.1. Ethic Approvals

The research procedures were conducted in accordance with the principles outlined in the Declaration of Helsinki, following the guidelines established in 2008 and the most recent amendment in 2013. Parental consent was obtained prior to the participation of the children in the study. Ethical approval was granted by the Research Ethics Committee of the Faculty of Medicine and Pharmacy at the University of Victor Babeş, Timişoara (IRB No. CEFMF/10, dated 30 May 2024).

1.2. Study Design and Participants

This study was conducted at the Pedodontics Dentistry Clinic, Faculty of Dentistry, University of Medicine and Pharmacy Victor Babeş, Timişoara, and involved a sample of children aged 1–6 years. Data were collected using a questionnaire administered to the parents, which assessed various aspects of their children's diets and screen time habits. The questionnaire gathered information on the duration of screen exposure—including television, computers, and phones—and the frequency of consumption of potentially cariogenic foods such as sweets, soft drinks, fast food, and snacks. This methodology aimed to explore the association between screen time and dietary habits within the specified age group, with a focus on potential implications for oral health.

Inclusion criteria required parents to have the ability to read and fully comprehend the questionnaire, while children had to fall within the specified age range. Children with developmental disorders or medical conditions affecting dietary habits were excluded. Initially, 121 children aged 1–6 years were enrolled in the study; however, 47 were excluded due to non-compliance with inclusion criteria (e.g., developmental disorders or incomplete questionnaires) or missing data. This resulted in a final sample size of 74 children (39 boys and 35 girls). The study utilized a cross-sectional design, collecting data on screen time and cariogenic food consumption through a structured parental questionnaire.

1.3. Data Collection

Data were collected using a questionnaire divided into three sections: demographic and anthropometric data, screen time, and eating behavior. The questionnaire was distributed to parents for completion after obtaining their informed consent. It collected information on general demographic details, children's screen time, eating behaviors, and specific characteristics of the children.

1.3.1. Demographics and Anthropometrics

General demographic information, including gender, age, the respondent's relationship to the child, and their level of education, was collected through the questionnaire.

1.3.2. Screen Time Assessment:

The time children spent on various screen-based activities, including television watching, playing video games, and using a computer, tablet, or smartphone, was reported

by parents. Screen time was categorized into levels based on the World Health Organization's recommendations for preschool-aged children, which suggest limiting screen time to less than one hour per day.

The frequency of cariogenic food consumption, including sweets, sugary drinks, and fast food, was assessed through the questionnaire using a 5-point Likert scale. Responses ranged from 1 ("never") to 5 ("always").

1.3.3. Cariogenic Food Consumption Assessment:

Cariogenic food consumption was assessed using a series of questions that asked about the frequency of consuming various cariogenic foods and drinks, including:

- Sugary snacks (e.g., candy, cookies, chips)
- Sweetened beverages (e.g., soda, juice, sports drinks)
- Refined carbohydrates (e.g., white bread, pasta, rice)
- Processed meats (e.g., hot dogs, sausages, bacon)

Parents were asked to report the frequency of consuming each food item, using a 5-point scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always).

1.3.4. Data Analysis:

Descriptive statistics summarized demographic data, screen time, and food consumption habits. Pearson's correlation was applied to explore the relationship between screen time and cariogenic food intake. Children were divided into two age groups (<4 years, >4 years) to examine age-related differences. All analyses were conducted using R 4.3.1 software.

1.3.5. Age-Related Analysis:

To examine age-related differences in the relationship between screen time and cariogenic food consumption, the study population was divided into two age groups: children younger than 4 years (n = 35) and children older than 4 years (n = 39). Separate correlation analyses were conducted for each age group to examine the relationship between screen time and cariogenic food consumption.

1.3.6. Statistical Software:

All data analyses were conducted using R 4.3.1 software.

RESULTS

The final study sample consisted of 74 children, of which 39 (52.7%) were boys and 35 (47.3%) were girls. Among these, 65% of children exceeded the recommended screen time limits of less than one hour per day. Table 1 provides a summary of demographic characteristics, screen time habits, and dietary behavior patterns across the study population. Children aged 4 years and older exhibited higher screen time and a greater frequency of consuming sugary snacks and drinks compared to younger children.

Table 1. Summary of demographic characteristics and behaviors

Variable	Total (N=74)	Age ≤ 4 Years (n=35)	Age > 4 Years (n=39)
Boys (%)	52.7%	48.6%	56.4%
Girls (%)	47.3%	51.4%	43.6%
Exceeding Screen Time (%)	65%	58%	71%
High Sugary Snack Intake (%)	43%	32%	51%

The first figure (Figure 1) explores the frequency of sugary drink consumption among children aged ≤4 years in relation to whether they are allowed to eat during screen time.

Among children not allowed to eat during screen time, 6 children consume sugary drinks once a week, another 6 children never consume sugary drinks, 4 children consume them less than once a week, and 1 child consumes them several times a week. In contrast, among children allowed to eat during screen time, 7 children consume sugary drinks less than once a week, 2 children never consume sugary drinks, 2 children consume them several times a week, and 1 child consumes them once a week. These findings suggest a slightly higher frequency of sugary drink consumption among children permitted to eat during screen time.

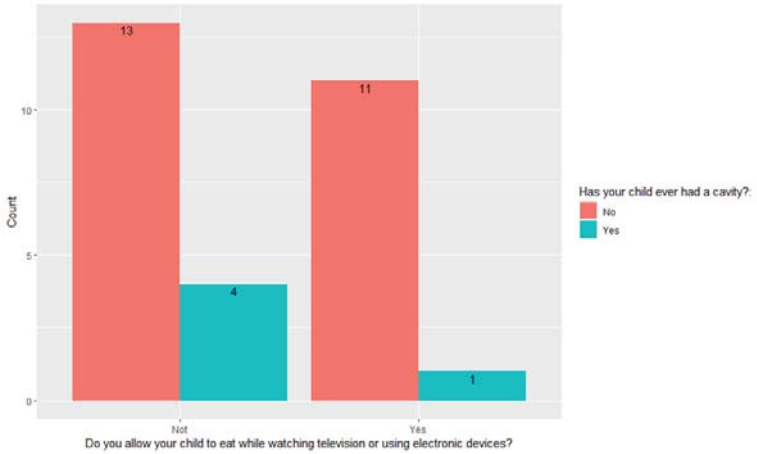

Figure 1. Association Between Eating Habits During Electronic Device Use and the Presence of Dental Caries in Children Aged ≤4 Years

The second figure (Figure 2) illustrates the frequency of sweet snack consumption among the same groups of children. Among those not allowed to eat during screen time, 8 children never consume sweet snacks, 6 children consume them less than once a week, 2 children consume them once a week, and 1 child consumes sweet snacks several times a week. Among children allowed to eat during screen time, 9 children never consume sweet snacks, 1 child consumes them less than once a week, 1 child consumes them once a week, and 1 child consumes sweet snacks several times a week. Overall, the majority of children, regardless of whether they are allowed to eat during screen time, do not consume sweet snacks.

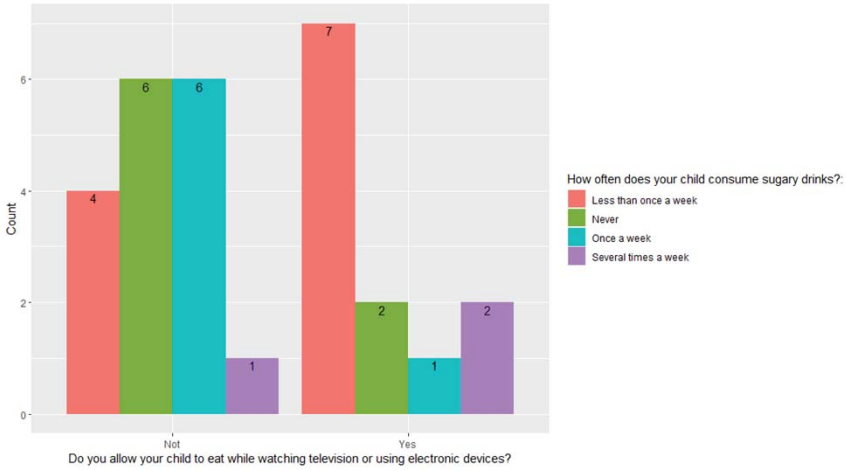

Figure 2. Association Between Screen-Time Eating Habits and Sugary Drink Consumption in Children Aged ≤4 Years

The third figure (Figure 3) examines the relationship between screen-time eating habits and the occurrence of cavities. Among children not allowed to eat during screen time, 13 children have never had a cavity, while 4 children have had at least one cavity. Among children allowed to eat during screen time, 11 children have never had a cavity, and 1 child has had at least one cavity. These results reveal a notable difference in cavity occurrence, with a higher prevalence of cavities observed in children who are allowed to eat during screen time.

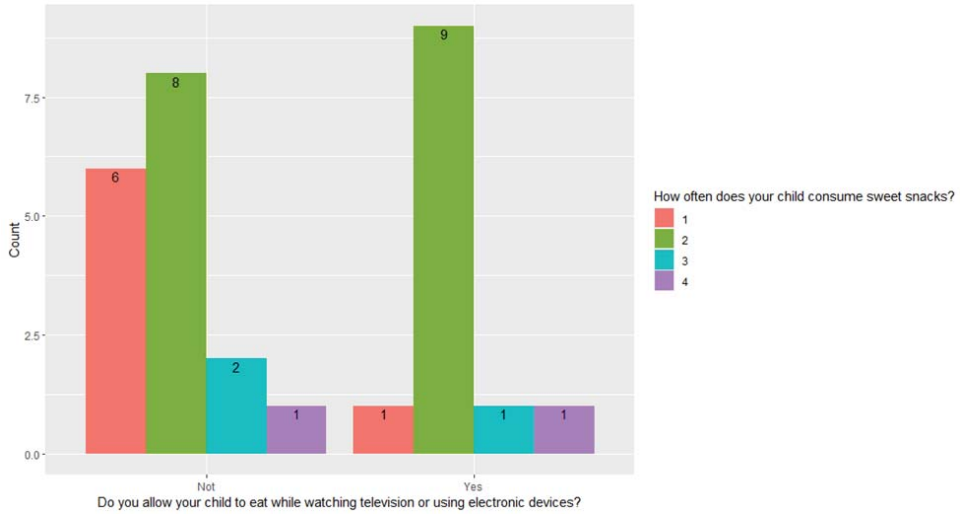

Figure 3. Relationship Between Screen-Time Eating Habits and Sweet Snack Consumption in Children Aged ≤4 Years

For children aged > 4 years, the figures analyze the potential impact of using electronic devices during meals on dental health and dietary habits: Children not allowed to eat with devices show an equal distribution of cavity cases, with 11 having cavities and 11 not. In contrast, among those permitted to eat with devices, 6 have cavities, while only 3 do not. This indicates a potential association between eating with electronic devices and a slightly higher prevalence of cavities (Figure 4).

Figure 5 highlights that children not eating with devices most often consume sugary drinks "less than once a week" (8) or "never" (8). On the other hand, children allowed to eat with devices show a higher frequency of sugary drink consumption, with 5 drinking them "once a week" and 3 "several times a week," suggesting a possible link between device use and increased sugary drink intake. Figure 6 illustrates that children not eating with devices tend to consume sweet snacks at moderate frequencies (6 at level 1, 8 at level 2). In comparison, children eating with devices are more likely to consume sweet snacks at higher frequencies, with fewer at the lowest level (3 at level 1) and more at the highest level (4 at level 4).

Overall, these findings suggest that eating while using electronic devices among children aged > 4 years may be linked to unhealthier dietary habits, including increased sugary drink and snack consumption, as well as a heightened risk of cavities. Further research is needed to confirm these associations and establish causation.

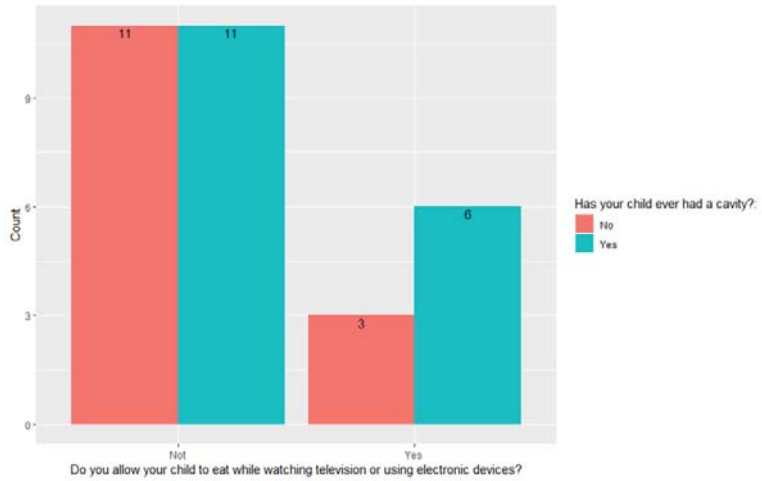

Figure 4. Association Between Eating Habits During Electronic Device Use and the Presence of Dental Caries in Children Aged > 4 Years

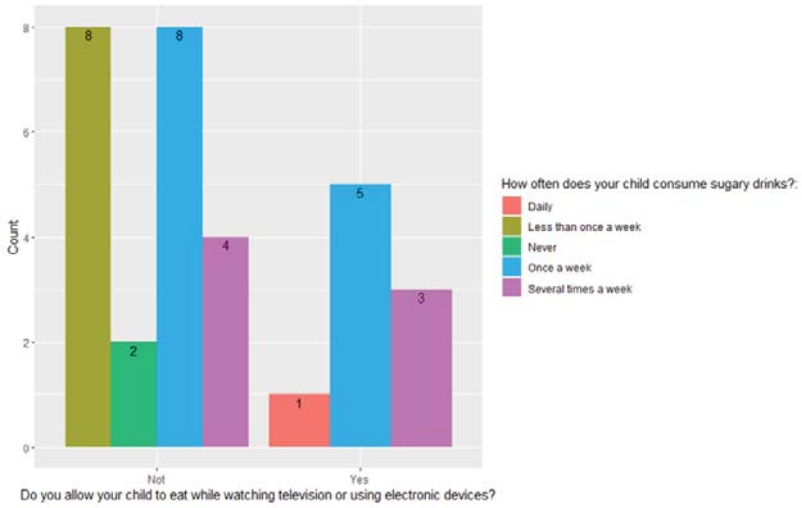

Figure 5. Association Between Screen-Time Eating Habits and Sugary Drink Consumption in Children Aged >4 Years

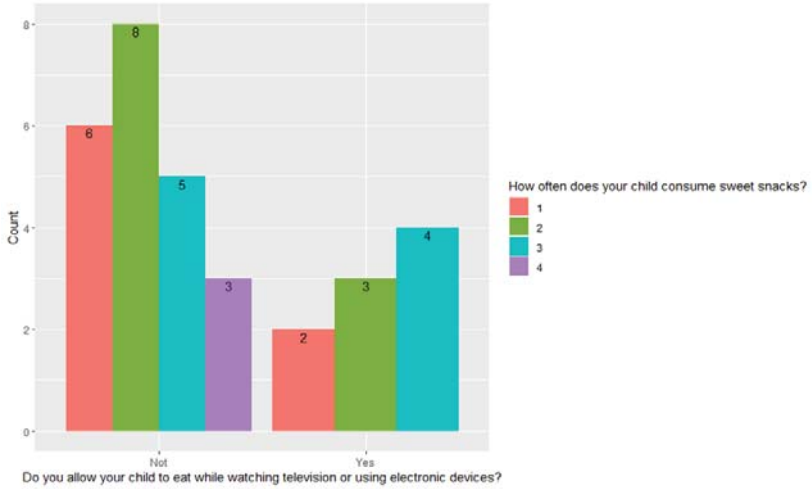

Figure 6. Relationship Between Screen-Time Eating Habits and Sweet Snack Consumption in Children Aged >4 Years

A significant positive correlation was identified between screen time and the frequency of sugary snack consumption ($r = 0.56$, $p < 0.05$). This relationship was particularly pronounced among children older than 4 years, who were more likely to engage in unhealthy eating habits as screen time increased. The correlation analysis underscores that prolonged screen exposure is associated with higher consumption of cariogenic foods, such as sugary snacks and drinks.

DISCUSSIONS

The results of this study are consistent with prior research indicating that screen time is linked to unhealthy eating behaviors, including the preference for sugary snacks and beverages. These behaviors contribute to a higher risk of developing dental caries, which is one of the most prevalent chronic conditions in children. Given the increasing screen time among young children, especially following the COVID-19 pandemic, there is an urgent need for public health interventions aimed at reducing screen time and promoting healthier eating habits. Moreover, the role of parents in monitoring both screen time and dietary habits is crucial. Parental education on the impact of screen time on children's overall health, including oral health, should be emphasized in health promotion campaigns. Furthermore, this study suggests the importance of implementing national guidelines on screen time and nutrition in early childhood to prevent long-term health issues.

According to the American Academy of Pediatrics (AAP), the guidelines for screen time are well-defined: no screen exposure for children under 18 months, a maximum of one hour per day for children aged 2-5 years, and for children aged 6 and older, restrictions should be imposed on both the duration of screen use and the type of media accessed. Similarly, the WHO recommends that preschoolers should spend less than one hour per day in front of electronic screens [22].This study reveals that 65% of children exceed the American Academy of Pediatrics (AAP) and WHO recommendation by spending more than 1 hour per day on screens, aligning with findings from a UK survey, where 79.4% of 5-year-old preschoolers reported using electronic screens for more than 1 hour daily [23]. Preschoolers in various regions around the world exhibit differing amounts of screen time, likely due to variations in economic levels. This suggests that particular attention should be given to children's screen time in economically developed regions [24].

Our study identified a significant positive correlation between screen time and the consumption of snacks and sugar-sweetened beverages (SSBs), which is consistent with findings from earlier research [25]. One potential explanation for this phenomenon is that preschool children may inadvertently consume energy-dense, nutrient-poor foods, such as snacks and SSBs, while interacting with electronic screens [26]. Numerous studies have indicated that extended exposure to screen time is associated with a reduced intake of fruits and vegetables, along with an increased consumption of snacks and sugar-sweetened beverages (SSBs) [25]. Additionally, research conducted on Canadian children demonstrated a positive correlation between television viewing and the consumption of energy-dense foods and beverages, as well as fast food, while showing a negative correlation with fruit and vegetable intake [27]. Therefore, the risk of developing dental caries is significantly higher due to the increased consumption of sugar-sweetened foods and beverages, as indicated by various studies [28]. Dental caries are not the only negative effects associated with sugar consumption; weight gain, type 2 diabetes, and certain cancers have also been linked to excessive sugar intake [29]. However, the majority of these studies have concentrated on school-aged children and adolescents [30], or have aimed to investigate the dangers associated with excessive screen time [31], Only a limited number of studies have attempted to examine the relationship between screen time and food consumption in preschoolers [32].

The preschool years are a critical stage for developing healthy eating behaviors and habits that play a key role in promoting long-term health into adulthood [25]. Therefore, it is essential to understand the current patterns of screen time in preschool children and how it relates to their food consumption. In Romania, there are few studies investigating the relationship between the use of electronic devices and eating behavior. In the future, further research on this topic is needed within the national context.

CONCLUSIONS

This study highlights a significant association between increased screen time and the consumption of cariogenic foods, which elevates the risk of dental caries in young children. As the prevalence of excessive screen time continues to rise, targeted interventions focusing on reducing screen time and promoting healthier dietary choices are essential. Dental health professionals should incorporate advice on screen time management and nutritional counseling into routine pediatric care to help mitigate the risk of dental caries and other related health conditions in children. Further research is needed to explore the long-term effects of early screen exposure on dietary habits and oral health outcomes.

Conflicts of Interest

The authors declare no conflict of interest.

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