

# Oral Health Status and Caries Experience in Children Diagnosed with Attention-deficit Hyperactive Disorder

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## ABSTRACT

**Aim:** The present study aimed to assess and evaluate oral hygiene status and oral hygiene behaviors among children with the attention-deficit hyperactive disorder (ADHD) and children without ADHD.

**Materials and methods:** A total of 34 children of ages 6–14 years were included in the study. Group I–17 children with ADHD and group II–17 healthy children. A visual examination of dental caries and traumatic injuries was performed, and the oral hygiene status of these children was determined. The parent/guardian completed a structured questionnaire regarding the child's oral hygiene practices and food habits. Data obtained from oral examination and questionnaires were compiled and subjected to statistical analysis.

**Results:** The student *t*-test and the Chi-squared test showed that children with ADHD had significantly higher decayed, missing, and filled teeth (DMFT) scores and incidence of traumatic injuries without significant difference in oral hygiene status.

**Conclusion:** There is no significant difference in oral hygiene status between both the groups but caries experience, and incidence of traumatic injuries are high in children with ADHD.

**Keywords:** Attention-deficit hyperactivity disorder, Dental caries, Oral health behavior, Traumatic dental injuries.

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## INTRODUCTION

According to the Diagnostic and Statistical Manual of Mental Disorders, "Attention-deficit Hyperactive Disorder is a neurological, psychiatric disorder characterized by significant problems with executive functions that cause attention deficits, hyperactivity, or impulsiveness inappropriate for that age."<sup>1</sup> ADHD is a lifelong neurodevelopmental disorder that is often noticeable by the age of 7 in children.<sup>2</sup> ADHD is associated with a wide range of comorbid conditions like epilepsy, developmental delay, mental retardation, low intelligence quotient, delayed speech, including learning and psychiatric disorders and substance abuse.

The prevalence of this disorder is as extensive as 2–18% of the world population and 3–6 times more prevalent in boys than in girls.<sup>3–5</sup> ADHD children may experience significant functional problems, such as academic underachievement, not maintaining good personal relationships with family members and peers, and low self-esteem.<sup>6,7</sup>

The prime concern of pediatric dentists about children with ADHD is their inability to perform regular and effective tooth brushing, which may secondarily lead to various dental problems, and beyond that, the diet and appetite of a child may also be affected by medications. Noneffective tooth brushing, high frequency of food intake, and other inappropriate behavioral problems are the prime risk factors for the initiation of caries and traumatic injuries. This study was conducted to assess and compare the oral hygiene status, caries experience, oral hygiene behaviors, and dental injuries among children with ADHD and without ADHD.

## MATERIALS AND METHODS

This study was carried out by the Department of Pedodontics, Kamineni Institute of Dental Sciences, Narketpally, after obtaining

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**Conflict of interest:** None

parental informed consent and approval from the Institutional Ethical Committee. A total of 34 children between the age-groups 6 and 14 years were included in the study.

- Group I: Children diagnosed with ADHD (*n* = 17)
- Group II: Healthy children (*n* = 17).

Group I includes children diagnosed with ADHD who were attending psychological counseling sessions at the National Institute of Mental Health, Secunderabad, between July and September 2019. Group II includes healthy children studying in B.G school, Bowenpally, Secunderabad. Children with other systemic diseases and children not interested in the study were excluded. ADHD children in the present study were diagnosed using the ADHD-symptom rating scale given by Merrell et al.<sup>8</sup> This scale consists of 56 entities regarding behavior, and each is given a score of 0–4 based on the frequency of occurrence of that particular behavior. The scoring criteria are as follows:<sup>8</sup>

Frequency of occurrence of behavior	Score
Behavior does not occur	0
Behavior occurs one to several times a month	1
Behavior occurs one to several times a week	2
Behavior occurs one to several times a day	3
Behavior occurs one to several times in an hour	4

Based on total score, percentile ranking is given and risk level is attributed as follows:<sup>8</sup>

Percentile ranking	Risk level
95 and above	High risk
85–94	At risk
25–84	Normal risk
24 and below	Low risk

Group I includes ADHD children in the “normal risk, and “at risk” category, and group II includes elementary school children from the same locality to reduce the selection bias. A total of 69 children were evaluated, and every 4th individual was selected using a simple random sampling technique to formulate the desired sample size as in the study group.

Oral and dental health evaluation of children was carried out using basic instruments mouth mirror and a dental explorer under natural light by a single calibrated examiner. The demographic data which includes the child’s name, age, and gender, teeth present, presence of traumatic injuries, oral hygiene index-simplified (OHI-S),<sup>9</sup> DMFT/decayed-exfoliated-filled teeth (def) index<sup>10</sup> were recorded. A structured questionnaire regarding oral hygiene practices and food habits was given to parents/guardians in both English and regional language, and they were requested to fill it up (questionnaire).

**RESULTS**

The Microsoft Excel and statistical package for social sciences software packages were used for data entry and analysis. The statistical difference between the groups was determined with a student t-test, and proportions were compared with a Chi-squared test of significance. The mean age of children is 9.82 years in group I and 9.65 years in group II.

Traumatic dental injuries and DMFT scores were statistically significant in ADHD children (group I) ( $p < 0.05$ ), but no such difference was observed in OHI-S ( $p = 0.7$ ) and def ( $p = 0.18$ ) scores between both the groups (Table 1). In group I, seven children were noticed with an Ellis fracture in relation to maxillary incisors and among them, five reported an Ellis class I fracture and two with an Ellis class II fracture. In group II only one child reported an Ellis class I fracture in relation to the maxillary central incisor (Fig. 1).

Six children in group I and nine children in group II fall under the score zero category of DMFT. In group I, three children were noticed with a score above four, whereas in group II no child was reported with a score of four or above (Fig. 2). Three children with poor oral hygiene were noticed in group I and two in group II. Good oral hygiene was seen in seven members of non-ADHD children (group II) and eight members of ADHD children (group I) (Fig. 3). In group I, 13 children brushed once daily, and two children brushed only under guidance, and in group II all children brushed once daily. Consumption of sugary snacks (>3 times/day) was more frequent in group I compared to group II, and occasional consumption of sugary snacks was more in group II compared to group I (Fig. 4).

**DISCUSSION**

Attention-deficit hyperactive disorder (ADHD) is one of the common neurodevelopmental/behavioral disorders of childhood, which is seen in around 6% of school-aged children.<sup>11</sup> Based on a series of symptoms in children, ADHD is classified into three subgroups: (1) the combined type, (2) the inattentive type, and (3) the hyperactive/impulsive type.<sup>12</sup> These children diagnosed with ADHD may not be able to perform oral hygiene practices properly due to their inattentivity and hyperactivity.

The probability of risk for injury or accident is higher in children with such developmental disabilities than in normal children.<sup>13</sup> In the present study, the incidence of traumatic dental injuries was significantly higher in children diagnosed with ADHD than in normal children ( $p < 0.05$ ). Maxillary central incisors are more significantly affected by traumatic injuries than other teeth, probably to their exposed position in the oral cavity.<sup>14</sup> In the present study, injury to maxillary central incisors was noticed in five children diagnosed with ADHD and only one member in the non-ADHD children. The fractures were mostly either involving enamel or enamel and dentin. Studies conducted by Sabuncuoğlu et al.,<sup>15</sup> Garcia-Godoy,<sup>16</sup> Cortes et al.,<sup>17</sup> and Marcenes et al.<sup>18</sup> also concluded that ADHD children were more prone to traumatic injuries than other healthy children.

In this study, when DMFT scores were compared between both the groups, it was found that ADHD children were significantly affected ( $p < 0.05$ ). Broadbent et al. concluded that ADHD children have high DMFT scores than non-ADHD children.<sup>3</sup> This can be attributed to their inability to perform proper oral hygiene practices due to inattentivity and hyperactivity, which may pose as a risk indicator for dental caries. ADHD medications may cause mouth dryness as a side effect, but their effect on salivary glands is inconclusive.<sup>19</sup> Few researchers have reported the same results of higher DMFT scores in children diagnosed with ADHD.<sup>20,21</sup> Studies that contradict the above findings were also reported.<sup>22,23</sup>

When oral hygiene behaviors of children in the study and control group were assessed, fewer children reported brushing twice a day, and many children reported brushing only under guidance in the ADHD group. Irregular tooth brushing at night was

**Table 1:** Comparison of the significance of def, DMFT, and OHI-S traumatic dental injuries

	Mean	Standard deviation	Standard error	Significance
def	.667	.577	.333	0.18
DMFT	-1.714	2.199	.588	0.012
OHI-S	-.059	.748	.181	0.075
Traumatic dental injuries	-1.000	1.620	.393	0.022

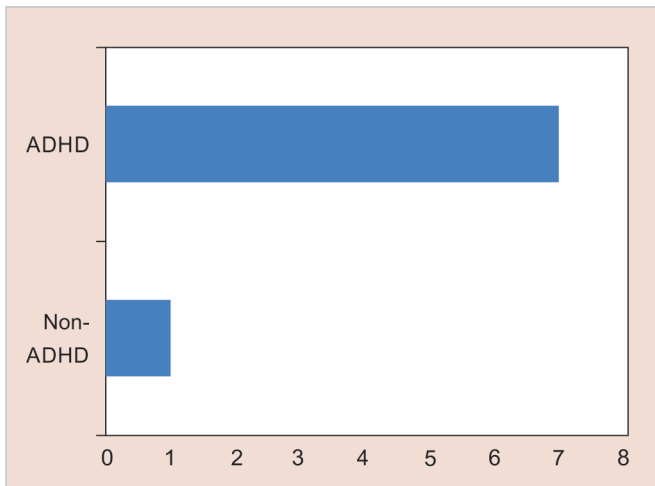


Fig. 1: Comparison of traumatic dental injuries in ADHD and non-ADHD groups

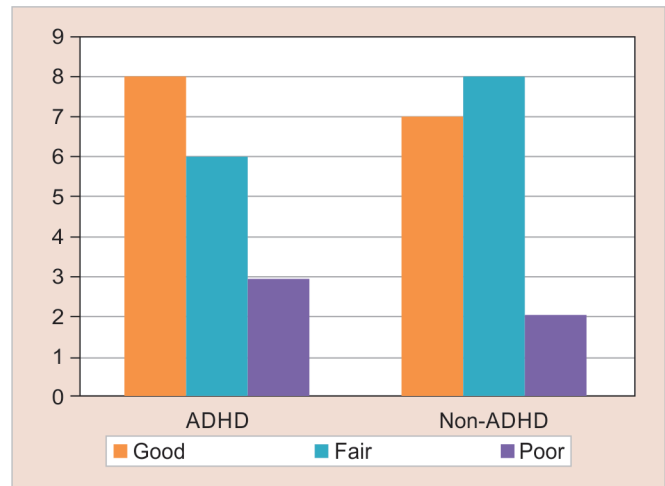


Fig. 3: Comparison of OHI-S index in ADHD and non-ADHD groups

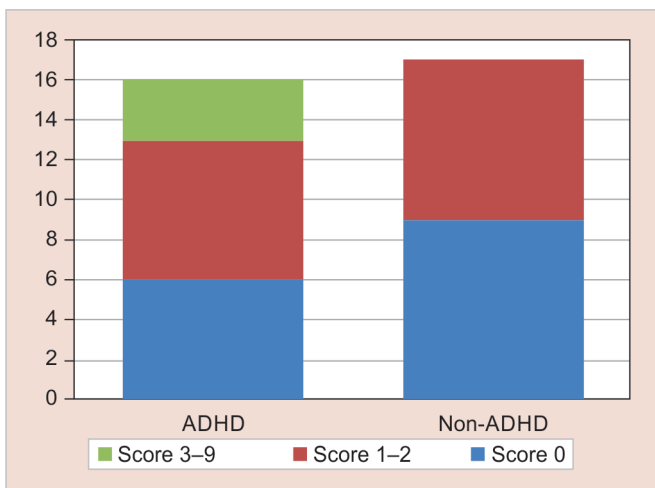


Fig. 2: Comparison of DMFT scores in ADHD and non-ADHD groups

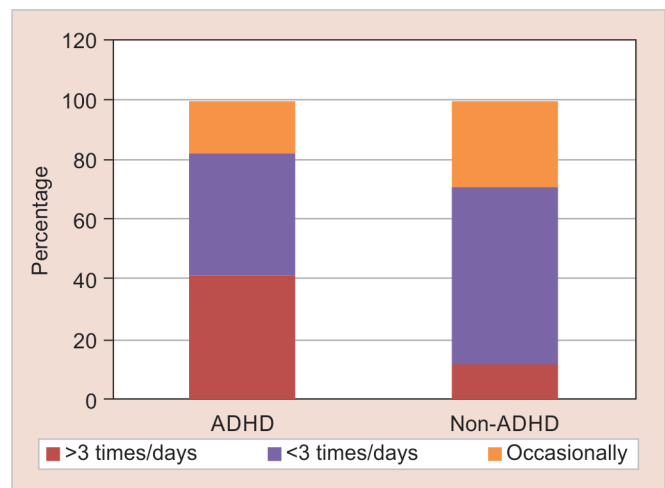


Fig. 4: Comparison of consumption of sugary snacks in ADHD and non-ADHD groups

also associated with high DMFT scores.<sup>20</sup> Verrips et al., in a study, stated that tooth brushing frequency was clearly related to caries.<sup>24</sup>

In the present study, consumption of sugary snacks was more frequent in ADHD children than in non-ADHD children. ADHD children, in general, have difficulty in foreseeing cause-effect relationships and generating solutions to problems.<sup>25</sup> Farmer JE et al., stated that these children anticipate fewer consequences following a risky behavior.<sup>26</sup> The relationship between dental caries and sugary snacks is that the prevalence of carious lesions will increase significantly with an increased carbohydrate diet.<sup>27</sup> Fraser J mentioned in her report that sugary soda consumption and mental disorder like hyperactivity and distress were correlated.<sup>28</sup> However, Grooms et al. in their study concluded that there was no difference between ADHD and non-ADHD children in tooth brushing or diet.<sup>3</sup>

Attention-deficit hyperactive disorder (ADHD) children find difficulty in planning and organizing a thing due to their poor executive functioning. Also, show distraction and starting trouble in activities that are not stimulating or interesting. They perform executive functions at a level comparable to a child who is 5 years younger than them.<sup>29</sup> So, ADHD children may need support from parents/caregivers in accomplishing daily oral health activities and directing them to maintain optimal oral and general health.

## CONCLUSION

This study implicates that caries prevalence and traumatic dental injuries were higher in ADHD children than in non-ADHD controls, which can be attributed to behavioral and dietary factors. Parents or caregivers need to monitor ADHD children regarding their oral hygiene maintenance and other dietary habits. They should be under frequent follow-ups for a dental check-up for good oral hygiene.

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