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Review Article

Attention-Deficit/Hyperactivity Disorder and Orthodontic Treatment: A Systematic Review with a Focus on Saudi Children

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Received: November 11, 2025; **Published:** November 30, 2025

Abstract

Introduction and Objective: Attention-deficit/hyperactivity disorder (ADHD) can affect oral health and orthodontic treatment through behavioral challenges and medication side effects. The reported prevalence in Saudi Arabia is inconsistent, which has important implications for orthodontic care. This study aimed to review the prevalence of ADHD in Saudi Arabia and synthesize international evidence on its impact on oral health and orthodontic treatment, with the goal of identifying strategies to optimize clinical management.

Methods: This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 guidelines. We searched PubMed, Scopus, Web of Science, and Saudi national repositories for studies published between 2010 and June 2025. Eligible studies included children or adolescents with ADHD reporting oral health status, orthodontic treatment adherence, or prevalence data. Study quality was assessed using the Joanna Briggs Institute, Newcastle-Ottawa Scale, or A Measurement Tool to Assess Systematic Reviews, version 2, depending on study type.

Results: Overall, 37 studies were included: eight Saudi epidemiologic reports and 29 international investigations addressing oral health and orthodontic outcomes. Saudi prevalence estimates ranged from 2.8% (a large national school survey) to 52.5% (a regional online sample), with a pooled meta-analytic estimate of approximately 12.4%. Children with ADHD consistently showed higher caries burden, elevated plaque and gingival scores, more frequent dental trauma, increased appliance breakage, greater absenteeism, and longer treatment durations. Stimulant medications were often associated with xerostomia and an increased risk of caries.

Conclusion: ADHD complicates orthodontic management by reducing treatment adherence and causing medication-related oral complications. In Saudi Arabia, the variable prevalence underscores the importance of screening in orthodontic practice. Tailored strategies involving caregivers, simplified treatment mechanics, enhanced preventive care, and closer follow-up are recommended.

Keywords: *ADHD; Orthodontics; Treatment Compliance; Oral Hygiene; Saudi Arabia; Children*

Main Points

- Attention-deficit/hyperactivity disorder (ADHD) affects a substantial number of orthodontic patients.
- Stimulant medications used for ADHD are often linked to xerostomia and an increased risk of dental caries.
- ADHD can negatively influence orthodontic treatment and outcomes.
- This review integrates Saudi and international evidence to guide orthodontic management of patients with ADHD.
- Tailored strategies involving caregiver participation, simplified mechanics, and enhanced preventive care are recommended to improve treatment outcomes.

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is one of the most commonly diagnosed neurodevelopmental disorders in childhood, characterized by persistent difficulties in sustaining attention, excessive physical activity, and impulsive behavior. Global prevalence among children typically ranges from 5% - 8%, although estimates vary depending on methodology. These behavioral traits can interfere with the structured routines necessary for successful orthodontic treatment, including maintaining appliance integrity, attending appointments consistently, and practicing diligent oral hygiene [1-5].

Pharmacological treatment, primarily with stimulant medications such as methylphenidate or amphetamine derivatives, is effective for symptom control but may cause oral side effects, including dry mouth and altered salivary flow, which can increase the risk of caries and orthodontic discomfort [6,7].

In Saudi Arabia, ADHD prevalence estimates are highly variable. Large-scale school screening programs report rates as low as 2 - 3%, whereas regional and online studies report substantially higher figures. A recent national meta-analysis estimated an overall prevalence of approximately 12.4% (95% confidence interval [CI] 5.4-26%) [8,9]. These discrepancies likely reflect methodological differences, cultural factors, and recruitment bias. Given this variability, Saudi orthodontists are likely to encounter a substantial number of affected patients, highlighting the need for evidence-based guidance tailored to local practice [10].

Aim of the Study

This study aimed to review the prevalence of ADHD in Saudi Arabia and synthesize international evidence on its impact on oral health and orthodontic treatment, with the goal of identifying strategies to optimize clinical management.

Methods

Protocol and registration

This review was registered with PROSPERO (CRD420251123656) and conducted in accordance with PRISMA 2020 guidelines (Figure 1). No approval was obtained or required, as this is a literature review article.

Search strategy

Comprehensive electronic searches were conducted in PubMed/MEDLINE, Scopus, Web of Science, and the Cochrane Library, as well as relevant Saudi research repositories. The search covered the period between January 2010 and June 2025 and included MeSH terms and keywords such as “ADHD”, “orthodontics”, “oral health”, “treatment compliance”, and “Saudi Arabia”. Reference lists of eligible articles were also screened.

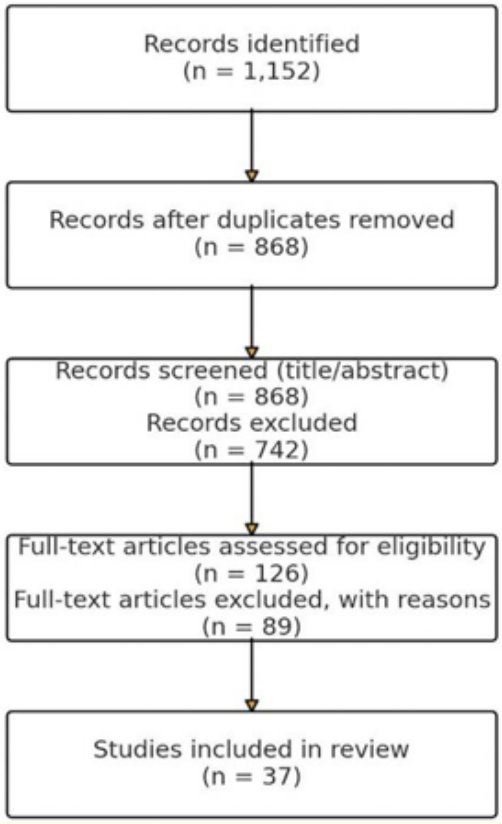

Figure 1: *PRISMA 2020 study selection flow diagram (JPEG). Legend: number of records identified, screened, excluded, and included.*

Eligibility criteria

We included studies of children and adolescents (≤ 18 years) with ADHD diagnosed using the Diagnostic and Statistical Manual of Mental Disorders, International Classification of Diseases, or validated rating scales. Eligible outcomes included oral health indices (caries/Decayed, Missing, and Filled Teeth (DMFT), plaque, and gingival scores), orthodontic treatment measures (compliance, appliance damage, and treatment duration), and prevalence data from Saudi populations. Excluded were case reports with fewer than five participants, editorials, and studies involving adults only.

Study selection and data extraction

Two reviewers independently screened titles, abstracts, and full texts. Data were extracted on study characteristics, sample size, diagnostic tools, outcomes, and key findings. Methodological quality was assessed using the Joanna Briggs Institute, the Newcastle-Ottawa Scale, or A MeaSurement Tool to Assess Systematic Reviews, version 2, depending on the study design.

Data synthesis

Owing to variability in outcomes and measurement tools, results were primarily synthesized narratively. When comparable data were available (e.g., DMFT scores), findings were summarized descriptively.

Results

Study selection and characteristics

Of 1,152 records retrieved, 868 remained after deduplication. Following full-text screening of 126 articles, 37 met the inclusion criteria: eight Saudi prevalence/epidemiology studies and 29 international investigations reporting oral health or orthodontic outcomes. Study designs included cross-sectional (n = 21), case-control (n = 9), prospective cohort (n = 5), and randomized trials (n = 2).

Prevalence of attention-deficit/hyperactivity disorder - Saudi data

Saudi studies showed wide variability:

- National school survey: A nationwide screening of over 440,000 primary school children identified ADHD in 2.8% of students.
- Regional/clinic-based reports: School studies from Riyadh and Jeddah reported prevalence rates between 7-16%, depending on the assessment tools used.
- Online surveys: Convenience-based surveys yielded higher figures (up to 52.5%).
- Meta-analysis: A pooled analysis of 14 Saudi studies estimated a prevalence of 12.4% (Table 1).

No.	Author (yr)	Country	Design	N (age yrs)	ADHD assessment	Orthodontic/oral outcome(s)
1	Genç., *et al*. 2020 (Turk J Orthod)29	Turkey	Cross-sectional	200 (8-15)	Clinical/ADHD rating	ADHD symptoms in orthodontic patients; implications for management
2	Kurniawan., *et al*. 2019 (Acta Med Philipp)30	Philippines	Case report/strategy	1 (child)	Clinical Dx	Practical orthodontic strategy in a child with ADHD
3	Pessah., *et al*. 2009 (Orthod Fr)31	France	Clinical report/review	—	Review/clinical	Orthodontic management strategies for children with ADHD
4	Blomqvist., *et al*. 2007	Sweden	Case-control	60 (10-16)	DSM-IV	Poorer OH in ADHD; behavior management needed
5	Mota-Veloso., *et al*. 2018	Brazil	Case-control	150	ADHD signs scale	ADHD signs increased the odds of caries
6	Chau., *et al*. 2017	Hong Kong	Cross-sectional	200	ADHD screening	Oral health deficits in ADHD children
7	Roy., *et al*. 2020	Canada	Cross-sectional	180	ADHD screening	Dental malocclusion association with ADHD
8	Hasanin., *et al*. 2021	Egypt	Retrospective comparative	120	Clinical records	3D craniofacial differences in ADHD adolescents
9	Andersson & Sonnesen, 2018	Denmark	Cross-sectional	80	ADHD screening	Sleepiness/occlusion correlations
10	Ehlers., *et al*. 2019	Germany	Cross-sectional	300	ADHD screening	Higher caries & poor OH in residential care ADHD

11	Sabuncuoglu., *et al*. 2005	Turkey	Cross-sectional	90	DSM	Higher trauma in ADHD
12	Broadbent., *et al*. 2016	NZ	Cohort	1,037	DSM	Longer orthodontic treatment time in behavior-risk groups
13	Al-Harthy., *et al*. 2021	KSA	Cohort	120	DSM-5	Higher plaque accumulation in ADHD patients
14	Alzahrani. 2024	KSA	Cross-sectional	512	DSM	Higher trauma and oral issues in ADHD

Table 1: *Selected characteristics of included studies (abridged) [11-14].*

Abbreviations: ADHD: Attention-Deficit/Hyperactivity Disorder; Dx: Diagnosis; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; OH: Oral Health; 3D: Three-Dimensional; DSM: Diagnostic and Statistical Manual of Mental Disorders; DSM-5: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; NZ: New Zealand; KSA: Kingdom of Saudi Arabia.

In summary, rigorous, large-scale screening studies report reduced prevalence rates, whereas less representative surveys tend to yield increased estimates. Orthodontic services in Saudi Arabia should anticipate that ADHD is commonly encountered in pediatric practice.

Global findings

Key patterns across studies:

- Dental caries: Children with ADHD consistently showed higher DMFT/dmft scores than their peers [15-17].
- Plaque/gingival indices: Poor daily hygiene routines contributed to elevated plaque and gingival index scores [16,18].
- Dental trauma: Increased impulsivity was associated with an elevated risk of traumatic dental injuries, particularly involving the upper incisors [19,20].

Orthodontic compliance and appliance outcomes: Multiple studies reported more frequent appliance breakage, missed appointments, and extended treatment durations in patients with ADHD [21-24].

Case reports and small cohort studies also describe effective management strategies and favorable outcomes when behavioral supports are implemented, such as parental reinforcement and simplified mechanics [6,25-27].

Pharmacologic effects: Stimulant medications are consistently associated with xerostomia and alterations in salivary composition/flow, which can increase caries risk; these findings were reported across observational cohorts [6,28].

Discussion

Principal findings

This review highlights that ADHD is consistently associated with poor oral hygiene, increased caries experience, more frequent trauma, and challenges with orthodontic treatment adherence. Prevalence estimates in Saudi Arabia vary; however, even conservative figures indicate that orthodontists will frequently encounter children with ADHD.

Behavioral mechanisms and orthodontic implications

Behavioral pathways: Inattention and impulsivity disrupt adherence to oral hygiene routines and proper use of removable appliances. These behaviors result in elevated plaque scores, increased appliance breakage, and missed appointments. Impulsivity additionally raises the risk of dental trauma.

Pharmacologic and biologic contributors

Stimulant medications commonly cause xerostomia and reduce salivary buffering capacity, thereby increasing susceptibility to caries [6,28]. Orthodontists should be vigilant by detecting dry mouth early, recommending saliva-stimulating measures (e.g. sugar-free gum, if appropriate), implementing topical fluoride regimens, and scheduling more frequent hygiene recalls.

Saudi-specific considerations

Saudi studies reflect global patterns and region-specific dynamics. Large-scale school screenings report reduced prevalence (≈ 2.8%) [8] whereas clinical/online samples indicate increased rates; a pooled meta-analysis estimates a prevalence of ~12.4% [9]. Cultural factors, including caregiver perceptions, stigma, healthcare access, and family caregiving structures, affect diagnostic rates and engagement with care. In Saudi settings with high parental involvement, orthodontists can effectively leverage caregiver support but should also anticipate potential inconsistencies when multiple caregivers are involved.

In Saudi Arabia, cultural attitudes toward ADHD diagnosis and reliance on parental support influence treatment experiences. High caregiver involvement can improve adherence, although inconsistencies among multiple caregivers may disrupt continuity. Clinicians should incorporate caregiver engagement into management planning.

Management recommendations for orthodontists

Clinical strategies:

- Screening: Include ADHD-related questions in intake forms and coordinate care with pediatricians or psychiatrists when appropriate.
- Communication: Provides short, stepwise instructions, supported by visual aids for home use.
- Behavioral support: Encourage parental monitoring, reward systems, and simplified routines.
- Appointment planning: Schedule brief visits during times when medication effects are optimal and use reminder systems.
- Appliance choice: Favor robust fixed appliances over removable devices that rely on patient compliance.
- Preventive care: Implement fluoride regimens, varnish applications, and quarterly hygiene recalls.
- Team-based care: Collaborate with pediatric specialists, psychologists, and dental hygienists.

Strengths and Limitations

Strengths of this review include comprehensive literature searches, integration of Saudi and international studies, and translation of findings into practical orthodontic strategies. Limitations arise from heterogeneous diagnostic methods, the predominance of cross-sectional study designs, and variable study quality.

Research Priorities

Future research should include longitudinal cohorts monitoring orthodontic outcomes in children with ADHD, randomized trials evaluating behavioral interventions, stratification by ADHD subtype, and standardized national prevalence surveys in Saudi Arabia using validated Arabic assessment tools.

Conclusion

ADHD is a common childhood condition that complicates orthodontic care owing to behavioral nonadherence and side effects of stimulant therapy. Given its prevalence among children in Saudi Arabia, orthodontists should incorporate screening, parental support, simplified treatment mechanics, and enhanced preventive measures into care. Future longitudinal and interventional studies in the Saudi context are needed to refine evidence-based strategies.

Bibliography

1. Polanczyk GV., *et al*. "ADHD prevalence estimates across three decades: an updated systematic review and meta-regression analysis". *International Journal of Epidemiology* 43.2 (2014): 434-442.

2. Thomas R., *et al*. "Prevalence of attention-deficit/hyperactivity disorder: a systematic review and meta-analysis". *Pediatrics* 135.4 (2015): e994-e1001.

3. Rosenberg SS., *et al*. "Attention deficit/hyperactivity disorder medication and dental caries in children". *Journal of Dental Hygiene* 88.6 (2014): 342-347.

4. Broadbent JM., *et al*. "Is attention-deficit hyperactivity disorder a risk factor for dental caries? A case-control study". *Caries Research* 38.1 (2004): 29-33.

5. Blomqvist M., *et al*. "Oral health, dental anxiety, and behavior management problems in children with attention deficit hyperactivity disorder". *European Journal of Oral Sciences* 114.5 (2006): 385-390.

6. Hidas A., *et al*. "Oral health status, salivary flow rate and salivary quality in children, adolescents and young adults with ADHD". *Archives of Oral Biology* 56.10 (2011): 1137-1141.

7. Katz-Sagi H., *et al*. "Increased dental trauma in children with attention deficit hyperactivity disorder treated with methylphenidate-a pilot study". *Journal of Clinical Pediatric Dentistry* 34.4 (2010): 287-289.

8. Al Daajani MM., *et al*. "Prevalence of health problems targeted by the National School-Based Screening Program among primary school students in Saudi Arabia, 2019". *Healthcare (Basel)* 9.10 (2021): 1310.

9. Aljadani AH., *et al*. "Prevalence and risk factors of attention deficit-hyperactivity disorder in the Saudi population: a systematic review and meta-analysis". *Saudi Journal of Medicine and Medical Sciences* 11.2 (2023): 126-134.

10. Al-Saedi ZS., *et al*. "Prevalence of attention deficit hyperactivity disorder among children in Makkah region, Saudi Arabia". *Cureus* 15.3 (2023): e35967.

11. Al Hamed JH., *et al*. "Attention deficit hyperactivity disorder (ADHD) among male primary school children in Dammam, Saudi Arabia: prevalence and associated factors". *Journal of the Egyptian Public Health Association* 83.3-4 (2008): 165-182.

12. Alhraiwil NJ., *et al*. "Systematic review of the epidemiology of attention deficit hyperactivity disorder in Arab countries". *Neurosciences (Riyadh)* 20.2 (2015): 137-144.

13. Asiri FYI., *et al*. "Oral health status, oral health behaviors, and oral health care utilization among persons with disabilities in Saudi Arabia". *International Journal of Environmental Research and Public Health* 19.24 (2022): 16633.

14. Sabuncuoglu O., *et al*. "Relationship between traumatic dental injuries and attention-deficit/hyperactivity disorder in children and adolescents: proposal of an explanatory model". *Dental Traumatology* 21.5 (2005): 249-253.

15. Mota-Veloso I., *et al*. "Do signs of attention-deficit/hyperactivity disorder increase the odds of dental caries? A case-control study". *Caries Research* 52.3 (2018): 212-219.

16. Chau YC., *et al*. "Oral health of children with attention deficit hyperactivity disorder". *European Journal of Oral Sciences* 125.1 (2017): 49-54.

17. Roy A., *et al*. "Dental malocclusion among children with attention deficit hyperactivity disorder". *American Journal of Orthodontics and Dentofacial Orthopedics* 158.5 (2020): 694-699.

18. Hasanin M., *et al*. "Three-dimensional analysis of upper airway and craniofacial morphology in orthodontic adolescents with attention deficit hyperactivity disorder (ADHD): a comparative retrospective study". *International Orthodontics* 19.4 (2021): 622-632.

19. Andersson H and Sonnesen L. "Sleepiness, occlusion, dental arch and palatal dimensions in children attention deficit hyperactivity disorder (ADHD)". *European Archives of Paediatric Dentistry* 19.2 (2018): 91-97.

20. Ehlers V., *et al*. "Oral health of children and adolescents with or without attention deficit hyperactivity disorder (ADHD) living in residential care in rural Rhineland-Palatinate, Germany". *BMC Oral Health* 19.1 (2019): 258.

21. Broadbent JM., *et al*. "Is attention-deficit hyperactivity disorder a risk factor for dental caries? A case-control study". *Caries Research* 38.1 (2004): 29-33.

22. Chaushu Stella., *et al*. "The orthodontic treatment of children with disabilities". *Refu'at ha-peh ṿeha-shinayim (1993)* 18.2 (2001): 42-50, 62.

23. Sheller B. "Challenges of managing child behavior in the 21st century dental setting". *Pediatric Dentistry* 26.2 (2004): 111-113.

24. Genç HA., *et al*. "Attention-deficit hyperactivity disorder symptoms in a group of children receiving orthodontic treatment in Turkey". *Turkish Journal of Orthodontics* 33.1 (2020): 31-36.

25. Kurniawan Ricky., *et al*. "Orthodontics treatment strategy and management in a child with attention deficit hyperactivity disorder". *Acta Medica Philippina* 53 (2019).

26. Pessah S., *et al*. "Traitement orthodontique des enfants atteints du trouble déficit de l'attention avec hyperactivité (TDAH) [Orthodontic treatment of children suffering from attention deficit disorder with hyperactivity (ADHD)]". *Orthodontie Française* 80.3 (2009): 331-338.

27. Blomqvist M., *et al*. "Dental caries in adolescents with attention deficit hyperactivity disorder: a population-based follow-up study". *European Journal of Oral Sciences* 119.5 (2011): 381-385.

28. Alzahrani AAH. "Attention deficit hyperactivity disorder and dental traumatic injuries: a systemic review and meta-analysis". *European Review for Medical and Pharmacological Sciences* 28.9 (2024): 3303-3312.

Volume 24 Issue 12 December 2025