Dental Management of a Child with Autism Spectrum Disorder and Attention-Deficit Hyperactivity Disorder

S Zafar[1], Dorothy Boyd[2], A Siddiqi[3]

[1]Discipline of Paediatric Dentistry, School of Dentistry/Oral Health Centre of WA, Australia, [2]University of Otago, Faculty of Dentistry, New Zealand, [3]Charles Sturt University, Australia

Abstract

The autism spectrum disorder and attention-deficit hyperactivity disorder are neuro-development disorders. The provision of dental care for affected children can be challenging because they are often unsettled in the dental environment. The dentist frequently must make adjustments in clinic practice and use behavior management strategies to meet the special needs of the patients with these disorders. This paper aims to report the dental care of a seven-year-old child with autism spectrum disorder and attention-deficit hyperactivity disorder and to discuss the dental management therapies that were utilized for the case.

Key Words: Autism spectrum disorder, Attention-deficit hyperactivity disorder, Dental management

Introduction

The autism spectrum disorder (ASD) and attention-deficit/ hyperactivity disorder (ADHD) are both neurodevelopment disorders and have been linked since Kanner [1] presented a case report of 11 children exhibiting markedly different behavior from any previously reported. In the last decade, there have been reports showing a relationship between both disorders [2-4]. However, to date, it is still unclear if they are true comorbid conditions or if one disorder is secondary to the other [5]. Autism spectrum disorder is characterized by impaired communication and social interaction skills, and repetitive and restricted behavior and interests (DSM-IV). Attention-deficit/hyperactivity disorder is characterized by learning and behavioral problems that include persistent hyperactivity, impulsiveness, and lack of attention, and these can have a significant adverse impact on an affected child's life - as well as upon the family and school of the child.

The prevalence of ASD is estimated to be approximately 1.0 -1.5% of the population [6]. The prevalence of ADHD is higher compared with autism with approximately 2-18% children presenting with this disorder [7-9]. The prevalence of ADHD in New Zealand was reported to be 6.7% [10]. Both disorders co-occur with high frequency, and the prevalence rates show that 30-80% of ASD children meet criteria for ADHD. Similarly, 20–50% of children with ADHD meet criteria for ASD, and both disorders are more common in males than females [11].

The exact etiology of both diseases is still unclear. However, it seems to be caused by a complex interaction of genetic, environmental, parental and psychosocial risk factors. Both disorders are heritable disorders, and family studies have shown that members of the same family with either ASD or ADHD frequently exhibit symptoms of the other disorder [12,13]. Neuroimaging studies showed the involvement of dopaminergic pathways [14-16]. Genetic linkage studies have identified chromosome 15q24 as potential loci harbouring risk genes for ADHD and ASD, and providing evidence for biological overlap between ADHD and ASD [17]. Various environmental and biological factors have also been shown to be related to the occurrence of both disorders. For ASD, increased paternal age (≥ 50 years) and for ADHD younger maternal age (≤ 21 years) seem to be a risk factor [18-20].

Table 1. Dental features related to patients with ASD and ADHD.

Developmental disorders	Anomalies of tooth morphology, macroglosia, drooling, a group of oral-pharyngeal pathologies some of which have aspects relating to ADHD pathogenesis
Eruption	Tooth eruption could be delayed due to drug induced hyperplasia
Caries	Higher incidence of caries was reported in the primary dentition. However, some studies also suggest lower rates of caries among ASD and ADHD children
Periodontal health	Poor oral hygiene due to the challenging behaviour, lack of awareness and training of the caregiver/parents
Malocclusion	Presence of malocclusions is common (high arched palate)
Para-functional habits	A higher prevalence of bruxism, tongue thrusting, snoring, nail and pencil biting, non-nutritive chewing
Traumatic injuries	The risk of traumatic dental injury is higher in children with ADHD. This could be due to malocclusion
Dental anxiety	Higher fear and dental anxiety on initial visit
Others	Self-injury, erosion, xerostomia, hyper-gag reflex

Various pregnancy-related risk factors also seem to increase the risk of both disorder including maternal diabetes [21,22], pre-clampsia [23], bacterial or viral infections. Additionally, maternal use of certain drugs that may influence neuronal

Corresponding author: Dr Sobia Zafar, BDS, MSc, DClinDent (Paediatric Dentistry), PhD, Specialist Paediatric Dentistry, Senior Lecturer - Discipline of Paediatric Dentistry, School of Dentistry/Oral Health Centre of WA, Nedlands, Australia, Tel: +61864577552; Fax: +61864577666; E-mail: sobia.zafar@uwa.edu.au

development during pregnancy such as valproic acid (or anti-psychotropic medications (SSRI related with ASD and bupropion related with ADHD) has also been reported to be a risk factor [24-26]. Various dental features have been associated with ASD and ADHD as shown in *Table 1*.

Several criteria have been used for the diagnosis of both disorders including the International Classification of Disease tenth revision (ICD-10) which is a system of coding, created by the World Health Organisation. The most commonly used criterion by clinicians and psychiatrists to diagnose these disorders is the Diagnostic and Statistical Manual of Mental Disorders version V (DSM-V). The diagnostic approach for ASD and ADHD is given in *Table 2*.

Table 2. *The diagnostic criteria for ASD and ADHD (DSM V).*

A person to be diagnosed with ASD should show a total of 6 items from the following diagnosis criteria 1, 2, and 3
1. Impairment in social interaction
- marked impairments in the use of multiple nonverbal behaviours such as eye-to-eye gaze, facial expression, body posture, and gestures to regulate social interaction
- failure to develop peer relationships appropriate to developmental level
- a lack of spontaneous seeking to share enjoyment, interests with others or achievements with other people
- lack of social or emotional reciprocity
2. Impairments in communication
- delay in, or total lack of, the development of spoken language
- In individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation - stereotyped and repetitive use of language
- Stereotyped and repetitive use of language or idiosyncratic language
- lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level
3. Restricted repetitive and stereotyped patterns of behavior
- encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
- inflexible adherence to specific, nonfunctional routines or rituals
- Stereotyped and repetitive motor mannerisms (e.g. hand or finger flapping or twisting, or complex whole-body movements
- Persistent preoccupation with parts of objects
A person to be diagnosed with ADHD should show a total of 6 items from the following diagnosis criteria 1, 2, and 3
1. Inattention
- fails to give attention to details
- difficulty in attention
- does not listen
- does not follow
- difficulty in organizing tasks
- reluctant to engage in tasks
- loses things necessary for tasks
- easily distracted
- forgetful in daily activities
2. Hyperactivity
- fidgets with or taps hands or feet
- often leaves seat in classroom
- often runs about or climbs excessively in inappropriate situations
- difficulty playing or engaging in leisure activities quietly
- “on the go” or “driven by a motor”
- often talks excessively
3. Impulsivity

- often blurts out answers
- often has difficulty awaiting turn
- often interrupts or intrudes on others

Case Report

A 7-year-old boy (KH) presented to the Discipline of Paediatric Dentistry, Faculty of Dentistry, University of Otago, New Zealand for dental recall examination. He was first referred to the Department of Paediatric Dentistry for the assessment of carious lesions by a Dunedin Public Hospital Paediatrician when he was five years old, and, owing to behavior management difficulties received comprehensive dental treatment under general anaesthesia at that time. He had not had dental review since then. KH was diagnosed with ASD when he was three years old and diagnosed with ADHD at the age of four.

He showed hyperactivity, impulsiveness, lack of attention, limited social interaction skills, sensory hypersensitivity, and repetitive and restricted behaviour and interests. His speech was impaired, and he had been receiving speech therapy since he was three years old. He had taken methylphenidate in the past and was now taking Melatonin (20 mg Tab in the evening) for the sleep disorder. He lives at home with his biological parents and one older healthy brother, and resides in an area without water fluoridation, and was not taking any fluoride supplements. At home, he brushed his teeth without supervision once or twice a day using 1000 ppm fluoride toothpaste. His diet was restricted because of his food preferences; he prefers soft food with no meat and very limited fruits and vegetables. His daily diet consisted of three white bread jam sandwiches, and one bowl of hot potato chips. As he has grown up, he has developed more coping skills, however, he still had a short span of co-operation in the dental chair, and was very sensitive to sound, light and taste. At that first visit background information was gathered from the parents, and a very limited dental examination was achieved. Use of a social story alongside a behaviour shaping approach was discussed for the next visit, with the aim of achieving a more thorough oral examination, and bitewing radiographs. Use of bitewing radiographs was shown to the parent, and a “practice film” was given to take home to help with familiarisation.

A social story was introduced and was strictly adhered to at the next dental visit. This was supplemented with modified tell-show-do, modelling and positive reinforcement. Although he was still very anxious he coped with a more thorough dental examination and his first set of bitewings on the dental chair. Extra-oral examination showed no significant findings (*Figure 1*). He was in the early mixed dentition stage, with first permanent molars and maxillary and mandibular central incisors fully erupted in the mouth. Permanent lower lateral incisors were partially erupted, and upper primary lateral incisors were mobile. Occlusion showed Class II molar relationship bilaterally with 2 mm overjet and 5% overbite (*Figure 2*).

Figure 1. *Facial photographs (frontal and lateral profile).*

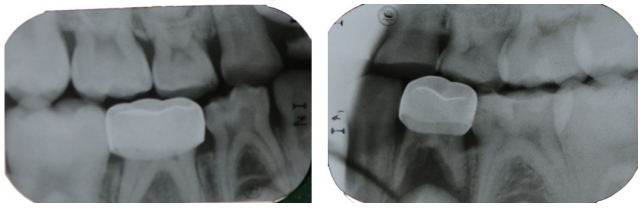

Figure 2. *Bitewing radiographs (initial visit).*

Mild plaque accumulation was noted on the posterior teeth with otherwise satisfactory oral hygiene on examination. Enamel wear was noted on the upper primary lateral incisors and upper primary canines, and the first permanent molars were not fissure sealed. There were stained composite restorations on the occlusal of the upper right first primary molar, upper and lower left second primary molars, and stainless steel crowns on the lower left first primary molar and lower right second primary molar. All of this treatment had been carried out under general anaesthesia (GA) 2 years 9 months previously. Although the bitewings had limited diagnostic quality on the left side, they provided enough information to plan the dental treatment (*Figure 3*), and showed inter-radicular pathological radiolucency related to the lower left first primary molar, which had previously received ferric sulphate pulpotomy and SSC. There were carious lesions affecting the lower right first primary molar, and upper left first primary molar. Keeping in mind his previous dental experience, recent improvements in his general behaviour, and that he coped with a thorough dental examination, radiographs and intraoral photographs for the first time, it was planned to provide preventive treatment in the dental chair using a social story with short appointments, and then to carry out extraction of the lower first primary molars and restorations under GA. Using the same behaviour management tools, and making sure that the same staff provided the care at each visit, and the same chair in the clinic was used, over a further two visits

plaque disclosure and demonstration of brushing and flossing, a full-mouth prophylaxis, fluoride application and fissure sealants on the first permanent molars were successfully completed. At this point there was discussion about whether he may manage to have the more invasive treatment in the same manner, however in agreement with the parents it was decided to continue with the planned general anaesthetic care for the extractions and restorations. Thus, the patient also received stainless steel crown of the upper left first primary molar, occlusal composite restorations of both upper second primary molars, and extractions of both lower first primary molars under GA. A post GA review appointment was arranged after three weeks, and at this visit the caries risk assessment was updated, and prevention of caries was discussed with the family. He was placed on 6-monthly recall visit.

Figure 3. *Intra-oral photos (initial visit).*

At recall appointments, again using a social story, the same staff and dental chair, bitewings were taken with no difficulty, and full mouth prophylaxis and fluoride application was carried out. There were no new carious lesions, and the lower first premolars erupted (*Figures 4-6*). His anxiety was much less evident in the dental setting, and 18 months later his family advised that he now appeared to look forward to the dental visits, and they felt he could now be seen with the family in the general dental setting, and no longer needed specialist paediatric dentistry support.

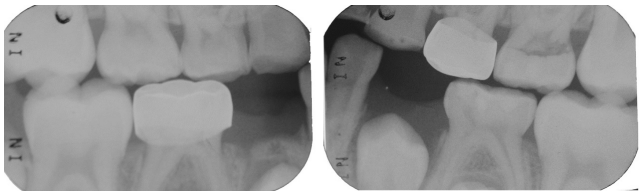

Figure 4. *Intra-oral photos (initial visit).*

Figure 5. *Intra-oral photos (6-month recall).*

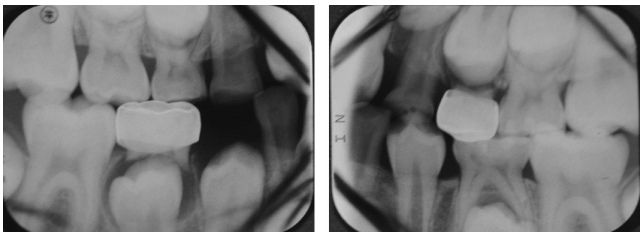

Figure 6. *Bitewing radiographs (12-month recall).*

Discussion

The provision of dental care for children with ASD and ADHD can be challenging because they are often unsettled in the dental environment. The dentist frequently must make adjustments in clinic practice and behaviour management strategies to meet the special needs of the patients with ASD/ ADHD. It is common for children on the ASD to have profound generalized anxieties. Research suggests that dental fear is the primary cause of uncompleted and uncooperative dental visits among ADHD and ASD children [27]. Currently, there are no large-scale studies conducted on the prevalence of anxiety in children with ASD or ADHD. Studies showed that 11% and 84% of children with ASD experience anxiety disorders including simple phobias, social phobia generalised anxiety disorder, obsessive-compulsive disorder, and separation anxiety disorder [28-30]. The prevalence of anxiety disorder in children with ADHD ranges from 20-34% [31] (The MTA Cooperative Group, 1999). Additionally this group of children may face problems in communicating their anxiety- related needs.

As well as anxiety, affected children may have unmet dental needs due to other multiple barriers to dental care. These barriers may include family or transport problems, economic, culture, language barriers and challenging behaviour may be an issue [32]. The patient's inability to accept dental treatment and the presence of the intellectual disability or developmental delay may further complicate the barriers to dental care experienced. The implications of these barriers are that poor oral health may ensue, and there are often delays in attending for dental care, receiving dental care or presenting for emergency dental care only. In this case there had been a

2-year delay in attending for follow-up. This had resulted in lost opportunities for acclimatisation visits and professional support for prevention of dental caries.

The literature regarding the dental caries experience in children with ASD and ADHD remains inconclusive. Some studies have demonstrated higher dmfs/DMFS scores in these children [33,34], while others have shown no differences [35,36]. The reduced cognitive functioning, sensory hypersensitivities (visual, auditory, olfactory or gustatory stimuli) and limited motor skills in some children with these disorders are associated with oral care difficulties such as reluctance to use toothpaste, poor oral hygiene, gingivitis and/or periodontal problems [37,38]. Furthermore, the use of the medications (that may cause xerostomia or a binge-eating pattern), selective diet, and poor oral hygiene practices are risk factors for dental caries [39]. Some studies have also shown a high prevalence of bruxism and higher levels of dental trauma in children and adults with ASD [40,41].

It is mandatory for the dentist to understand these particular challenges so that they can provide support to enable coping at a dental visit. Parents and caregivers serve as a valuable resource, as they are aware what works best for their child [42]. The use of desensitisation appointments in which the child is repeatedly exposed to the dental environment may help in the adaptation of the child to a dental setting [43]. For this to succeed, the parents/caregivers must be well informed about the purpose of the visits, and willing to bring the child for multiple appointments. The duration of the appointment should be short, and the same dental staff should see the child at each appointment, with adherence to routines and as little change to the environment as possible. Some studies have shown that the use of visual supports including books with colour pictures, video modelling or the use of social stories was successful when introducing dentistry to children, and this is used widely with those affected by ASDs. The social story is devised as a concept /tool to improve the social skills of individuals with ASD and is used to educate them about appropriate situations. They were introduced and described by [44] Gray and Garand, and later become standard practice for working with children with ASD (The Gray Center for Social Learning and Understanding, 2013). Many studies evaluated the use of introduction of a social story in a dental setting in children with ASD. The results of these studies showed increased co-operation of children with ASD with the use of social story describing every step of a dental examination [45,46]. Thus the introduction of a social story and the implementation of behaviour management strategies can assist children towards appropriate behaviour in a dental setting. KH responded extremely well to the first social story, and thus other behaviour management strategies could be added to facilitate his adapting to the dental setting.

The standard behaviour management strategies such as tell-show-do, direct observation (using a hand mirror), positive reinforcement, distraction, and voice control may not be successful in these children. The operator should be efficient when treating these children, allow frequent small breaks during the appointment, give clear, simple and consistent instructions, and encourage the child to stay focused on the appointment. In this case, KH responded well to positive reinforcement, and the tell-show-do technique was modified by stressing the “show” and “do” aspect of the technique, and limiting the verbal explanations. Many children with ADHD are on the medication methylphenidate to support their behaviour, and thus the timing of the dental appointments, usually early in the morning should be considered. Any interruptions should be avoided during the appointment, and the dental surgery environment should be calm, the staff should be few, and as already mentioned, whenever possible, the same staff for all appointments should be used. A behaviour management checklist that could be utilised for these patients is given in *Table 3*.

Table 3. *Suggestions for managing the patient with ASD, ADHD or ASD/ADHD.*

No.	Behaviour management strategy
1	Pre-clinical evaluation (Personal details, medications, previous experiences)
2	Pre-clinical behavioural preparations (verbal/non-verbal, interests, signs of behavioural change, parental inputs, rewards)
3	Setting the stage (teaching tools, social story, increase familiarity and understanding)
4	Reproduce the story (attention to detail – use the same staff and dental environment for all the appointments if possible)
5	Clear instructions (one at a time) and positive reinforcement
6	Short appointments with frequent breaks, minimise distractions
7	Tell-show-do (TSD) technique (avoid excessive language, stress the aspect that works best for the individual child), direct observation, maintain eye contact if appropriate
8	Rewards and reinforcements for the next visit

Depending on the age, the level of anxiety, the level of cooperation and extent of dental treatment required by the patient, the use of sedation and general anaesthesia should be considered in treatment planning. In KH case, the use of general anaesthesia was considered appropriate for the more complex aspects of treatment. This may have helped to maintain the positive response to dental care by avoiding over-challenging the child. Seeing him again in the usual dental environment soon after the GA care was intended to assist with recollecting and solidifying past positive experiences in the dental setting, so that these could be reinforced at recall visits.

It would be ideal for patients diagnosed with ASD and ADHD to have an early introduction to the dental clinic with carefully planned de-sensitisation appointment and a use of social story. To help have a relaxed appointment, it may be helpful if a child is allowed to bring comfort items such as soft toys or electronic gadgets. At the initial appointment, the child's level of intellectual and cognitive abilities should be determined to make a management plan based on an individual's dental needs. Early caries risk assessment and caries reduction strategies are of prime importance in minimising the healthcare needs of special patients. In this case report, the limited soft diet, poor oral hygiene, and lack of access to fluoride were all risk factors for dental caries. Although the diet did not change in the time KH was seen, working with the family to improve oral hygiene, and increase exposure to fluoride by use of twice yearly fluoride varnish was carried out. The utilisation of the behaviour management strategies, alongside the very supportive parental influence resulted in the increased coping skills of this child in the dental setting.

As the number of children identified with ASD and ADHD grows, so does the necessity for early and accurate prevention and management of their dental and oral needs. Dentists may come into contact with patients with such conditions in need of dental treatment, and they face multiple challenges while managing these patients. Understanding the challenges associated with their dental management and the utilisation of appropriate behaviour management techniques may result in effective treatment approaches. The current report reflects the appropriate use of the behaviour management techniques that resulted in improved acceptance for dental treatment by such challenging patients.

Conflict of Interest

No conflicts of interest to declare.

References

1. Kanner L. Autistic disturbances of affective contact. *Nervous Child.* 1943; **2**: 217-250.

2. Gillberg C, Billstedt E. Autism and Asperger syndrome: Coexistence with other clinical disorders. *Acta Psychiatrica Scandinavica.* 2000; **102**: 321-330.

3. Reiersen AM, Todd RD. Co-occurrence of ADHD and autism spectrum disorders: phenomenology and treatment. *Expert Review of Neurotherapeutics.* 2008; **8**: 657-669.

4. Gargaro BA, Rinehart NJ, Bradshaw JL, Tonge BJ, Sheppard DM. Autism and ADHD: How far have we come in the comorbidity debate? *Neuroscience & Biobehavioral Reviews.* 2011; **35**: 1081-1088.

5. Sinzig J, Walter D, Doepfner M. Attention deficit/ hyperactivity disorder in children and adolescents with autism spectrum disorder: Symptom or syndrome? *Journal of Attention Disorders.* 2009; **13**: 117-126.

6. Baio J. Prevalence of autism spectrum disorder among children aged 8 years: Autism and developmental disabilities monitoring network, 11 sites, United States, 2010. *Morbidity and Mortality Weekly Report.* 2014; **63**: 1-21.

7. Rowland AS, Umbach DM, Catoe KE, Stallone L, Long S, et al. Studying the epidemiology of attention-deficit hyperactivity disorder: Screening method and pilot results. *The Canadian Journal of Psychiatry.* 2001; **46**: 931-940.

8. Barbaresi WJ, Katusic SK, Colligan RC, Pankratz VS, Weaver AL, et al. How common is attention-deficit/ hyperactivity disorder? Incidence in a population- based birth cohort in Rochester, Minn. *Archives of Pediatrics and Adolescent Medicine.* 2002; **156**: 217-224.

9. Thomas R, Sanders S, Doust J, Beller E, Glasziou P. Prevalence of Attention-Deficit/Hyperactivity Disorder: A Systematic Review and Meta-analysis. *Pediatrics.* 2015; **135**: 1-8.

10. Anderson JC, Williams S, McGee R, Silva PA. DSM-III disorders in preadolescent children: Prevalence in a large sample from the general population. *Archives of General Psychiatry.* 1987; **44**: 69-76.

11. American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 4thedn, Text Revision. American Psychiatric Association, Washington, DC. 2000.

12. Mulligan A, Anney RJ, O'Regan M, Chen W, Butler L, et al. Autism symptoms in attention-deficit/hyperactivity disorder: a familial trait which correlates with conduct, oppositional defiant, language and motor disorders. *Journal of Autism and Developmental Disorders.* 2009; **39**: 197-209.

13. Nijmeijer JS, Hoekstra PJ, Minderaa RB, Buitelaar JK, Altink E, et al. PDD symptoms in ADHD, an independent familial trait? *Journal of Abnormal Child Psychology.* 2009; **37**: 443-453.

14. Nieoullon A. Dopamine and the regulation of cognition and attention. *Progress in Neurobiology.* 2002; **67**: 53-83.

15. Eliez S, Reiss AL. MRI neuroimaging of childhood psychiatric disorders: a selective review. *Journal of Child Psychology and Psychiatry.* 2004; **41**: 679-694.

16. Hill EL. Executive dysfunction in autism. *Trends in Cognitive Sciences.* 2004; **8**: 26-32.

17. Nijmeijer JS, Arias-Vasquez A, Rommelse NN, Altink ME, Anney RJ, et al. Identifying loci for the overlap between attention-deficit/hyperactivity disorder and autism spectrum disorder using a genome-wide QTL linkage approach. *Journal of the American Academy of Child and Adolescent Psychiatry.* 2010; **49**: 675-685.

18. Hultman CM, Sandin S, Levine SZ, Lichtenstein P, Reichenberg A. Advancing paternal age and risk of autism: new evidence from a population-based study and a meta-analysis of epidemiological studies. *Molecular Psychiatry.* 2011; **16**: 1203-1212.

19. Galera C, Cote SM, Bouvard MP, Pingault JB, Melchior M, et al. Early risk factors for hyperactivity-impulsivity and inattention trajectories from age 17 months to 8 years. *Archives of General Psychiatry.* 2011; **68**: 1267-1275.

20. Gustafsson P, Kallen K. Perinatal, maternal, and fetal characteristics of children diagnosed with attention-deficithyperactivity disorder: results from a population-based study utilizing the Swedish Medical Birth Register. *Developmental Medicine & Child Neurology.* 2011; **53**: 263-268.

21. Lyall K, Pauls DL, Spiegelman D, Ascherio A, Santangelo SL. Pregnancy complications and obstetric suboptimality in association with autism spectrum disorders in children of the Nurses' Health Study II. *Autism Research.* 2012; **5**: 21-30.

22. Nomura Y, Marks DJ, Grossman B, Yoon M, Loudon H, et al. Exposure to gestational diabetes mellitus and low socioeconomic status: effects on neurocognitive development and risk of attention-deficit/hyperactivity disorder in offspring. *Archives of Pediatrics and Adolescent Medicine.* 2012; **166**: 337-343.

23. Mann JR, McDermott S, Bao H, Hardin J, Gregg A. Preeclampsia, birth weight, and autism spectrum disorders. *Journal of Autism and Developmental Disorders.* 2010; **40**: 548-554.

24. Rasalam AD, Hailey H, Williams JH, Moore SJ. Characteristics of fetal anticonvulsant syndrome associated autistic disorder. *Developmental Medicine & Child Neurology.* 2005; **47**: 551-555.

25. Figueroa R. Use of antidepressants during pregnancy and risk of attention-deficit/hyperactivity disorder in the offspring. *Journal of Developmental and Behavioral Pediatrics.* 2010; **31**: 641-648.

26. Cohen MJ, Meador KJ, Browning N, Baker GA, Clayton-Smith J, et al. Fetal antiepileptic drug exposure: motor, adaptive, and

emotional/behavioral functioning at age 3 years. *Epilepsy & Behavior.* 2011; **22**: 240-246.

27. Klingberg G. Dental anxiety and behaviour management problems in paediatric dentistry-a review of background factors and diagnostics. *European Archives of Paediatric Dentistry.* 2008; **9**: 11-15.

28. Muris P, Steerneman P, Merckelbach H, Holdrinet I, Meesters C. Comorbid anxiety symptoms in children with pervasive developmental disorders. *Journal of Anxiety Disorders.* 1998; **12**: 387-393.

29. de Bruin EI, Ferdinand RF, Meester S, de Nijs PF, Verheij F. High rates of psychiatric co-morbidity in PDD-NOS. *Journal of Autism and Developmental Disorders.* 2006; **37**: 877-886.

30. Simonoff E, Pickles A, Charman T, Chandler S, Loucas T, et al. Psychiatric disorders in children with autism spectrum disorders: prevalence, comorbidity, and associated factors in a population-derived sample. *Journal of the American Academy of Child and Adolescent Psychiatry.* 2008; **47**: 921-929.

31. The MTA Cooperative Group. A 14-month randomized clinical trial of treatment strategies for attention deficit hyperactivity disorder. *Archives of General Psychiatry.* 1999; **56**: 1073-1086.

32. Friedlander AH, Yagiela JA, Paterno VI, Mahler ME. The neuropathology, medical management and dental implications of autism. *The Journal of the American Dental Association.* 2006; **137**: 1517-1527.

33. Broadbent JM, Ayers KMS, Thomson WM. Is attention-deficit hyperactivity disorder a risk factor for dental caries? A case-control study. *Caries Research.* 2004; **38**: 29-33.

34. Jaber MA. Dental caries experience, oral health status and treatment needs of dental patients with autism. *Journal of Applied Oral Science.* 2011; **19**: 212-217.

35. Namal N, Vehit HE, Koksal S. Do autistic children have higher levels of caries? A cross-sectional study in Turkish children. *Journal of Indian Society of Pedodontics and Preventive Dentistry.* 2007; **25**: 97-102.

36. Loo CY, Graham RM, Hughes CV. The caries experience and behavior of dental patients with autism spectrum disorder. *The Journal of the American Dental Association.* 2008; **139**: 1518-1524.

37. Stein LI, Polido JC, Mailloux Z, Coleman GG, Cermak SA. Oral care and sensory sensitivities in children with autism spectrum disorders. *Special Care in Dentistry.* 2011; **31**: 102-110.

38. Luppanapornlarp S, Leelataweewud P, Putongkam P, Ketanont S. Periodontal status and orthodontic treatment need of autistic children. *World Journal of Orthodontics.* 2010; **11**: 256-261.

39. Smith AM, Roux S, Naidoo NT, Venter DJ. Food choice of tactile defensive children. *Nutrition.* 2005; **21**: 14-19.

40. Barnoy EL, Najdowski AC, Tarbox J, Wilke AE, Nollet MD. Evaluation of a multicomponent intervention for diurnal bruxism in a young child with autism. *Journal of Applied Behavior Analysis.* 2009; **42**: 845-848.

41. Fahlvik-Planefeldt C, Herrstrom P. Dental care of autistic children within the non-specialized public dental service. *Swedish Dental Journal.* 2001; **25**: 113-118.

42. Murray CM, Naysmith KE, C-H Liu G, Drummond BK. A review of Attention-Deficit/Hyperactivity Disorder from the dental perspective. *New Zealand Dental Journal.* 2012; **108**: 95-101.

43. Klein U, Nowak AJ. Autistic disorder: a review for the pediatric dentist. *Pediatric Dentistry.* 1998; **20**: 312-7.

44. https://www.autismspeaks.org/site-wide/gray-center-social-learning-and-understanding

45. Bäckman B, Pilebro C. Visual pedagogy in dentistry for children with autism. *ASDC Journal of Dentistry for Children.* 1999; **66**: 325-31.

46. Orellana LM, Martínez-Sanchis S, Silvestre FJ. Training adults and children with an autism spectrum disorder to be compliant with a clinical dental assessment using a TEACCH-based approach. *Journal of Autism and Developmental Disorders.* 2014; **44**: 776-85.