



By reader
panellist
and student
dental
therapist

Sophie Haddley

Introduction

Autism in children presents with a variety of features.¹ There is no single cause but research has found that genetics, environment and neuropsychopathy may have an aetiological role in it.² Diagnostic criteria for autism in the UK are outlined on the website of the National Autistic Society.¹

Children with autism may have a more restricted diet due to sensory issues, food hypersensitivity and anxiety surrounding mealtimes.³ This could potentially have an impact on oral health.

Baron-Cohen *et al.* estimated the prevalence of autism in school children in the UK to be 157 per 10,000, making autism a relatively common condition that we are likely to encounter in clinical dental practice.⁴

Between 2017-2018, over 26,000 5-9-year olds were admitted to hospital as a result of 'tooth decay'.⁵ The impact that dental caries can have on child's life is significant, potentially leading to pain, infection and time off school/activities.

Dental therapists have an important role in treating caries, which is implicated in the General Dental Council's *Scope of practice*.⁶ A multidisciplinary approach from various members of the dental team, from dental therapists to dentists, can help to ensure that dental caries in children is well treated. It can also help promote the dental therapist's role within the dental team.

As a student dental therapist, I have seen children with varying degrees of autism and a high caries experience. The parents/carers of these children report very limited diets, including beige-coloured and bland foods and fixation on certain food types, eg high sugar drinks. I was keen to find out whether research indicates this pattern is common for dental patients with autism.

Aim

It is the aim of this literature review to investigate the evidence relating to the question: 'Do children with autism have a higher caries prevalence in comparison to non-autistic children?'

Autism and caries prevalence: a literature review

©wlopixel/istock/Getty Images Plus

Methodology

From September to October 2020 searches were completed using Web of Science and Google Scholar.

For Web of Science, Boolean operating terms were used: [caries AND prevalence AND autism OR Autistic spectrum disorder AND DMFT AND dmft].

Web of Science yielded 19 results. Seven were found to meet the inclusion criteria: one systematic review, three systematic review and meta-analyses, one cross-sectional case-controlled study and two cross-sectional studies.

Google Scholar yielded 650 results which reduced to 24 once more appropriate terms and filters were applied. Thirteen duplicates were removed. The remaining 11 were screened and three were found to meet the inclusion criteria: two case-controlled studies and one cross-sectional survey.

I was sent three additional papers of interest by a tutor with an interest in this topic (Personal communication, G. Jackson, 2021). Two of these met the inclusion criteria. Both of these were systematic reviews with meta-analyses. Following critical appraisal, only one of these papers was included.

The inclusion criteria included:

- Papers printed in the English language
- Papers published within the last ten years (2010-2020)
- Any study types including systematic reviews and meta-analysis
- Metric used = DMFT/dmft [Decayed, Missing and Filled permanent Teeth].

The exclusion criteria included:

- Studies not in the English language
- Studies published prior to 2010
- Studies that are not sensitive to autism as a disability.

The CASP (Critical Appraisal Skills Programme) tool was used for case-control studies and systematic reviews.⁷ The AXIS tool⁸ was used to critically appraise cross-sectional studies. For meta-analysis, the critical appraisal tool created by the Center for Evidence-Based Management was applied.⁹

Results

The papers reviewed showed wide heterogeneity. Some studies found that subjects with autism were more inclined to have higher DMFT/dmft scores, therefore, a higher prevalence of caries. Three studies found no statistical difference between DMFT/dmft in children with autism versus the control group. One study found DMFT/dmft was lower in individuals with autism.

When looking at studies that indicated

children with autism had a higher prevalence of caries, two of the studies^{10,11} were cross-sectional surveys. The nature of these study designs means that there is no control group.

Robertson *et al.*,¹² Zhang *et al.*¹³ and Tulumbaci *et al.*¹⁴ demonstrated results that indicated no statistical difference for children with autism and control groups. Tulumbaci *et al.* demonstrated the difference in DMFT of study group and control group to be 0.2, which does not show a statistical difference.¹⁴ Furthermore, Zhang *et al.* stated that the weighted mean difference between the study groups and control groups in the papers analysed was 0.43 which is not statistically significant.¹³

Fakroon *et al.*¹⁴ was the only study to present findings where the group with autism was shown to have a lower prevalence of caries in comparison to the control group. The DMFT score for the group with autism was 0.22 and DMFT for the control group 1.¹⁵, which is a difference of one tooth per mouth.

mirror, explorer and William's probe.¹⁰ The examination conditions were optimal. In their cross-sectional study, Hariyani *et al.*¹⁶ used natural lighting near a window to examine the subjects. This brings into question the validity of these results in particular as caries may easily be missed due to poor lighting.

Another point raised when considering examination methods was the use of a single examiner versus multiple examiners. Fakroon *et al.*¹⁴ used two examiners who were calibrated and blinded to the aims of the study. Inter-examiner reliability was assessed two weeks later, establishing a 0.95 reliability score. In terms of results, Fakroon found the DMFT score of children with ASD [autistic spectrum disorder] to be lower than the control group. The justification of inter examiner reliability as well as the p value being established as 0.001 (very precise)¹⁴ indicates strength for these results.

Jaber and Tulumbaci *et al.* utilised a

‘Children with autism may have a more restricted diet due to sensory issues, food hypersensitivity and anxiety surrounding mealtimes.’

Discussion

There seems to be a mixture of reported outcomes in terms of the impact autism has on caries risk. When analysing the results from each study, different factors will have an influence on the outcome, and what degree of confidence we can gain from these results.

Jaber¹⁰ produced a case-controlled study in which 61 patients with autism were studied along with 61 controls, who matched the study group in terms of age, sex and socioeconomic status. There was a male to female ratio of 45:16 in each group. This raises concerns with regards to gender bias as the distribution of males to females is approximately three to one. However, the study has justified this as it reflects the higher prevalence of diagnosed autism in males versus females. This proportion of higher males to females in the study group was also seen in Fakroon *et al.* who justified their male to female ratio of 4:1 due to the distribution of autism in Libyan children.¹⁴

Furthermore, Jaber's case-controlled study was designed so that each child was examined by a single examiner for oral hygiene status and dental caries in a dental chair using a dental

single examiner when performing oral examination.^{10,14} Whilst this may decrease inequalities in comparison to utilising multiple examiners, it may increase examiner bias. Neither study carried out precision assessments to ensure reliability of the examiners. In terms of results, Jaber found caries prevalence in children with autism to be significantly higher than those without with a p value of $p < 0.05$, which is significant. Tulumbaci found no statistical difference in DMFT/dmft scores between control and study group with $p = 0.43$.¹⁴

The systematic reviews and meta-analyses mainly focused on oral health status as a whole rather than caries specifically. However, each paper measured caries incidence using DMFT/dmft, therefore meeting the inclusion criteria. Generally, systematic reviews and meta-analyses indicated no statistically significant difference in the DMFT/dmft scores of children with autism compared to control groups.

Robertson *et al.* focused their study on children with and without learning disabilities, rather than autism.¹² The study categorised each condition and set out the results separately. Bias was assessed at length by the authors of this

review. The intra-study risk of bias was assessed as a mean of 5.2, meaning a medium to high risk of bias across the studies. Critically, this study has gone to great lengths to establish sources and implications of bias, strengthening the quality of this study. Conversely, Corridore *et al.*¹⁷ did not indicate risk of bias or indicate the significance of results. This decreases the potential quality of the results as we were unable to establish the precision and accuracy of the results.

The sample sizes within the systematic reviews and meta-analyses were all of a large size, representative of good population sizes. Nunes de Silva *et al.*¹⁸ had a sample size of 780, which allows for good representation of the population. Furthermore, a large sample size allows for a more precise estimate of the treatment effect (Biau *et al.*),¹⁹ which in this case gives a more accurate representation of caries prevalence in children with autism.

Regional differences in DMFT/dmft and caries prevalence were found. Zhang *et al.*

representative of the sample and the school, the results (which found a DMFT of 3.42) may not be applicable to the wider population as the study group is so specifically placed. Furthermore, as a cross-sectional survey, there was not a control group. This causes difficulties in establishing whether caries prevalence in higher or lower in individuals with autism than a control. Whilst p values were assessed to establish whether gender, age and caries have a statistically significant relationship (both p values were assessed as $p < 0.05$ therefore statistically significant), no values were calculated to assess overall significance of these DMFT/dmft values.

Overall, it would seem that caries prevalence in children with autism is not significantly different to those without autism and methodical, systematic assessment of all caries risk factors is required for all children. When taking into account level and quality of evidence and assessment of bias, SR and MA indicated

with autism and improving oral health.

Acknowledgements

With thanks to my supervising tutor Guy Jackson for all the help and support throughout the literature review process.

With thanks to Gillian Ford for proofreading this review and continued support throughout my degree.

With thanks to Cherise McColl for your help and support throughout the last three years.

References

1. National Autistic Society. *What is autism?* Available at: <https://www.autism.org.uk/advice-and-guidance/what-is-autism> (accessed 9 September 2020).
2. Chandrashekhar S, Bommangoudar J S. Management of autistic patients in dental office: a clinical update. *Int J Clin Pediatr Dent* 2018; **11**: 219-227.
3. BDA. The Association of UK Dietitians. Food Fact Sheet. Autism. Available at: <https://www.bda.uk.com/uploads/assets/077fd454-338d-4aaa-a1d0d6434200a3c3/Autism-food-fact.pdf> (accessed 19 November 2020).
4. Baron-Cohen S, Scott F J, Allison C, Williams J, Bolton P, Matthews F E, Brayne C. Prevalence of autism-spectrum conditions: UK school-based population study. *Br J Psychiatry* 2009; **194**: 500-509.
5. Royal College of Surgeons of England. Number of children aged 5 to 9 admitted to hospital due to tooth decay rises again. 26 September 2018. Available at: <https://www.rcseng.ac.uk/news-and-events/media-centre/press-releases/hospital-admission-tooth-decay/> (accessed 10 September 2020).
6. General Dental Council. *Scope of practice*. 2013. Available at: https://www.gdc-uk.org/docs/default-source/scope-of-practice/scope-of-practice.pdf?sfvrsn=8f417ca8_4_ (accessed 16 November 2020).
7. Critical Skills Appraisal Programme. CASP checklists. Available at: <https://casp-uk.net/casp-tools-checklists/> (accessed 6 October 2020).
8. Downes M J, Brennan M L, Williams H C, Dean R S. Development of a critical appraisal tool to assess the quality of cross-sectional studies (AXIS). *BMJ Open* 2016; **6**: e011458.
9. Center for Evidence-Based Management. Critical Appraisal of a Meta-Analysis or Systematic Review. 13 February 2014. Available at: <https://www.cebm.org/wp-content/uploads/Critical-Appraisal-Questions-for-a-SR-or-MA.pdf> (accessed 5 November 2020).

‘This raises the question as to whether cultural differences have an impact on caries prevalence in children with autism.’

established that globally, no statistical differences in DMFT/dmft were found.¹³ However, they found that within Asia, children with autism had a significantly higher index of DMFT/dmft. Nunes da Silva *et al.* utilised research from a wide range of locations, including USA and Japan.¹⁸ Six out of the seven studies they reviewed were based in Asia, and they found that these studies showed a higher prevalence of caries than in the USA.

Therefore, this raises the question as to whether cultural differences have an impact on caries prevalence in children with autism. This may be a consequence of differences in diet or potential differences in the way autism is identified and managed.

A common theme throughout the papers critically appraised was the study groups being selected from autism centres and schools. These are residential and non-residential centres where the needs of children with autism are specifically met and education is tailored to their needs, which may be a source of bias.

For example, Naidoo *et al.* recruited 149 children from a special needs school in a region in South Africa.¹¹ Whilst the results may be

no difference in DMFT/dmft values. The methodology of some primary research may have introduced bias.

Recommendations

I feel that positive changes can be implemented, in terms of further research and future policies/guidance.

These include:

- Epidemiological studies that cover larger geographical areas to establish worldwide trends and whether regional differences in DMFT/dmft are common
- Guidelines outlining how autism could potentially influence oral health and how clinicians can adapt their approach to ensure children with autism have access to tailored dental care which meets their specific, individual needs.

I appreciate that these recommendations may require funding and identifying researchers who have a keen interest in autism in dentistry. With the increasing prevalence of autism within the population, these would be pivotal in creating a better clinical experience for children

'It would seem that caries prevalence in children with autism is not significantly different to those without autism and assessment of all risk factors is required.'

10. Jaber M A. Dental caries experience, oral health status and treatment needs of dental patients with autism. *J Appl Oral Sci* 2011; **19**: 212-217.
11. Naidoo M, Singh S. The oral health status of children with autism spectrum disorder in KwaZulu-Nata, South Africa. *BMC Oral Health* 2018; **18**: 165. doi: 10.1186/s12903-018-0632-1.
12. Robertson M D, Schwendicke F, Pinheiro de Araujo M *et al*. Dental caries experience, care index and restorative in children with learning disabilities and children without learning disabilities; a systematic review and meta-analysis. *BMC Oral Health* 2019; **19**: 146. doi: 10.1186/s12903-019-0795-4.
13. Zhang Y, Lin L, Liu J, Lu J. Dental caries status in autistic children: a meta-analysis. *J Autism Dev Disord* 2020; **50**: 1249-1257.
14. Tulumbaci F, Korkut E, Özer H. Comparative evaluation of oral health status in healthy children and children with Autism Spectrum Disorder. *J Pediatr Infect Dis* 2020; **15**: 223-227.
15. Fakroon S, Arheiam A, Omar S. Dental caries experience and periodontal treatment needs of children with autistic spectrum disorder. *Eur Arch Paediatr Dent* 2015; **16**: 205-209.
16. Hariyani N, Soebekti R H, Setyowati D *et al*. Factors influencing the severity of dental caries among Indonesian children with autism spectrum disorder – a pilot study. *Clin Cosmet Investig Dent* 2019; **11**: 227-233.
17. Corridore D, Zumbo G, Corvino I *et al*. Prevalence of oral disease and treatment types proposed to children affected Autism Spectrum Disorder in pediatric dentistry: a systematic review. *Clin Ter* 2020; **171**: 275-282.
18. Nunes Da Silva S, Gimenez T, Souza R C *et al*. Oral health status of children and young adults with autism spectrum disorders: systematic review and meta-analysis. *Int J Paediatr Dent* 2017; **27**: 388-398.
19. Biau D J, Kernéis S, Porcher R. Statistics in brief: the importance of sample size in the planning and interpretation of medical research. *Clin Orthop Relat Res* 2008; **466**: 2282-2288.

Useful resources

- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders: DSM-5*. Arlington, Virginia: American Psychiatric Association, 2013.
- Aveyard H. *Doing a literature review in health and social care: a practical guide*. Maidenhead: McGraw-Hill Education, 2014.
- Baron-Cohen S. Leo Kanner, Hans Asperger, and the discover of autism. *Lancet* 2015; **386**: 1329-1330. Available at: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)00337-2/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)00337-2/fulltext) (accessed 19 November 2020).
- Burgette J M, Rezaie A. Association between Autism Spectrum Disorder and caregiver-reported dental caries in children. *JDR Clin Trans Res* 2020; **5**: 254-261.
- Kuter B, Guler N. Caries experience, oral disorders, oral hygiene practices and socio-demographic characteristics of autistic children. *Eur J Paediatr Dent* 2018; **20**: 237-241.
- University of Edinburgh. Centre for Cognitive Ageing and Cognitive Epidemiology. *Systematic reviews and meta-analyses: a step-by-step guide*.
- Available at: <https://www.ccace.ed.ac.uk/research/software-resources/systematic-reviews-and-meta-analyses> (accessed 29 November 2020).

<https://doi.org/10.1038/s41407-021-0648-2>

Why didn't you tell me?

FREE



10 FREE hours of CPD a year



<https://cpd.bda.org/login/index.php>

BDJ Team