

ORAL HEALTH DISPARITIES AMONG CHILDREN WITH AUTISM SPECTRUM DISORDER AND TYPICALLY DEVELOPING PEERS: A CASE-CONTROL STUDY AT UNIVERSITI TEKNOLOGI MARA

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Abstract

Children diagnosed with autism spectrum disorder (ASD) may not manifest distinct oral characteristics related to ASD, yet the disorder itself could impact their oral health. This case-control study aimed to assess and compare oral hygiene, dental caries, and periodontal status between children with and without ASD. Twenty-eight children with ASD and thirty without ASD (aged 3 to 16 years) attending the paediatric dentistry clinic at UiTM, Sungai Buloh campus, underwent clinical oral examinations. Parameters included Modified Gingival Index (MGI), simplified Basic Periodontal Examination (sBPE), Oral Hygiene-Simplified Index (OHI-S), DMFT, and dmft scores. Chi-square and independent *t* test were used to compare the two groups. *p* values < 0.05 were considered statistically significant. Children with ASD showed a higher prevalence of poor oral hygiene (3.6%) compared to those without ASD (0.0%). MGI indicated a higher percentage of moderate inflammation in children with ASD (3.6%). sBPE revealed higher rates of bleeding on probing (67.9%) and calculus deposits (28.6%) in children with ASD compared to those without ASD (60.0% and 20.0%, respectively). Children with ASD showed a higher mean (SD) DMFT of 1.57 (3.9) compared to those without ASD, 0.83 (1.67), and children without ASD had a higher mean (SD) dmft of 5.87 (5.78) in contrast to children with ASD, 4.5 (5.45). These differences did not reach statistical significance. Despite the numerical variations, it was not statistically confirmed that children with ASD are at a significantly higher risk of dental caries and periodontal diseases. Early detection of risk factors for these conditions in children with ASD is crucial for preventive interventions.

Keywords: Autism Spectrum Disorder, Children, Oral Health, Caries, Periodontal Disease

Introduction

Managing comprehensive dental treatment for children with special needs, particularly those diagnosed with autism spectrum disorder (ASD), poses unique challenges for paediatric dentists (1). ASD, characterised by social communication impairments and repetitive behaviours, often involves language and speech difficulties as well as limited social interaction skills (2, 3). Children with ASD may also experience sensory processing dysfunction, including oral sensory sensitivity, complicating oral hygiene practices for parents (4). The provision of individualised dental care for this

population becomes especially complex for dental teams. While the prevalence of ASD has been on the rise globally, with estimates ranging from 0.8 to 93 per 1000 individuals, there is a lack of official prevalence data in Malaysia (5-8). Despite ASD not presenting specific oral characteristics, concerns about poor oral hygiene, increased dental caries, and compromised periodontal health have been reported in this population (9-11). A meta-analysis by da Silva et al. highlighted challenges in maintaining good oral hygiene, irregular dental check-ups, and untreated caries among children with ASD (12).

However, inconsistencies in the prevalence of oral health issues, such as caries and periodontal problems, have been noted in existing literature (13-15). Zhang et al. (14) and Pi et al. (16) emphasised the need for more reliable conclusions and further research on oral health issues in children with ASD, including gingivitis, periodontitis, dental plaque, and dental calculus. As of the study's commencement, there was a notable research gap in understanding the oral health status of children with ASD in Malaysia. This study aims to address the existing research gap by assessing and comparing the oral hygiene status, dental caries, and periodontal health of children with ASD and those without ASD. The research will be conducted at the paediatric dentistry clinic of the Faculty of Dentistry, Universiti Teknologi MARA, Sungai Buloh campus. The findings from this study are anticipated to contribute valuable insights into the oral health challenges faced by children with ASD, thereby informing tailored dental interventions for this population.

Materials and Methods

Study design and participants

This case-control study, conducted at the Faculty of Dentistry, Universiti Teknologi MARA, Sungai Buloh campus, was carried out from January 2022 to July 2023. This study included children aged 3 to 16, both with and without ASD. Inclusion criteria comprised ASD children diagnosed by a neurologist/child psychiatrist/paediatrician (with or without learning disability), medical fitness, and parental consent. Exclusion criteria involved lack of parental consent, medication-related xerostomia or gingival hyperplasia, and conditions impacting dental health (e.g., Down's syndrome, diabetes mellitus) (2, 17-19).

Sample size calculation was based on bleeding on probing of 0.69 (SD 0.56), as observed by Qiao et al. (3). A sample size of a total of 60 children was estimated to have 80% power to identify similar bleeding on probing.

Group allocation and data collection

Participants were categorised into a study group (children with ASD) and a control group (those without ASD). Recruitment involved inviting eligible individuals identified from Paediatric Dentistry and Special Needs clinic records. A comprehensive clinical oral examination, including caries and restorative assessment, plaque and calculus scoring, and periodontal evaluation using Modified Gingival Index

(MGI) and Simplified Basic Periodontal Examination (sBPE), was performed. Oral Hygiene Index-Simplified (OHI-S) measured oral hygiene status (19-24).

Ethical approval and examiner calibration

The study received ethical approval from the UiTM Research Ethics Committee (REC/07/2021 (FB/45), dated December 2, 2021). Clinical examinations were performed by one examiner. Prior to commencement, intra-examiner reliability for periodontal health and caries status was ensured through calibration exercises and assessed using Kappa statistics.

Data analysis

Data collected was analysed using IBM Statistical Programme for Social Science (SPSS Version 29.0, IBM Knowledge Center, USA). Demographics and clinical parameters of children with and without ASD were compared with independent t-test (age, DMFT and dmft) and Chi-square test (gender, MGI, sBPE and OHI-S). Statistical significance was kept at a p-value of < 0.05.

Results

Demographic characteristics of participants

Table 1 depicts the age and gender distribution of the participating children in the study. There were more male children (92.9%) diagnosed with ASD compared to females (7.1%). The mean (SD) age for the study group was 10.11 (2.89), while the mean (SD) age for the counterpart group was 9.43 (3.01). However, the mean age difference was not statistically significant.

Comparative analysis of clinical parameters in children with and without ASD

Table 2 presents the caries experience in permanent teeth, as indicated by the Decayed-Missing-Filled Teeth (DMFT) index, and in deciduous teeth, represented by the decayed-missing-filled teeth (dmft) index. Statistical significance was set at $p < 0.05$. The study revealed that children with autism spectrum disorder (ASD) exhibited a higher mean (SD) DMFT with a value of 1.57 (3.9) compared to children without ASD, which was 0.83 (1.67). However, this difference did not achieve statistical significance ($p = 0.15$).

Conversely, the dmft index showed a higher mean (SD) in children without ASD which was 5.87 (5.78) compared to the ASD group, 4.5 (5.45), and similarly, this result was not statistically significant ($p = 0.5$).

Table 1: Demographic parameters

| Demographic parameters | Children with ASD (n = 28) | | Children without ASD (n = 30) | | p-value |
|------------------------|----------------------------|-----------|-------------------------------|-----------|------------------|
| | Mean (SD) | n (%) | Mean (SD) | n (%) | |
| Age | 10.11 (2.89) | | 9.43 (3.01) | | 0.5 ^a |
| Gender | | | | | |
| Male | | 26 (92.9) | | 28 (93.3) | 1.0 ^b |
| Female | | 2 (7.1) | | 2 (6.7) | |

Statistically significance set at $p < 0.05$

^a: Independent t-test

^b: Chi-square test

Table 2: Comparative analysis of dental caries parameters in children with and without ASD

| Clinical parameters | Children with ASD (n = 28) | Children without ASD (n = 30) | p -value |
|-------------------------------------|-------------------------------|----------------------------------|-------------------|
| | Mean (SD) | | |
| Decayed-missing-filled teeth (DMFT) | 1.57 (3.9) | 0.83 (1.67) | 0.15 ^a |
| decayed-missing-filled teeth (dmft) | 4.5 (5.45) | 5.87 (5.78) | 0.5 ^a |

Statistically significance set at $p < 0.05$

^a: Independent t-test

Table 3: Comparative analysis of oral hygiene and periodontal indices in children with and without ASD

| Oral hygiene index-simplified (OHI-S) | | | | |
|---|--------------------------------------|---------------------------------------|----------------------------|-------------------|
| | Good n (%) | Moderate n (%) | Poor n (%) | p-value |
| Children with ASD (n=28) | 24 (85.7) | 3 (10.7) | 1 (3.6) | 0.22 ^b |
| Children without ASD (n=30) | 29 (96.7) | 1 (3.3) | 0 (0.0) | |
| Modified Gingival Index (MGI) | | | | |
| | Normal n (%) | Mild n (%) | Moderate n (%) | p-value |
| Children with ASD (n=28) | 13 (46.4) | 14 (50.0) | 1 (3.6) | 0.7 ^b |
| Children without ASD (n=30) | 13 (43.3) | 17 (56.7) | 0 (0.0) | |
| Simplified Basic Periodontal Examination (SBPE) | | | | |
| | No periodontal pocketing n (%) | Bleeding on probing (BoP) n (%) | Calculus deposits n (%) | p-value |
| Children with ASD (n=28) | 1 (3.6) | 19 (67.9) | 8 (28.6) | 0.18 ^b |
| Children without ASD (n=30) | 6 (20.0) | 18 (60.0) | 6 (20.0) | |

Statistically significance set at $p < 0.05$

^b: Chi-square test

These findings suggest a trend towards increased caries experience in permanent dentition among children without ASD, although further investigation may be warranted to elucidate potential contributing factors. Table 3 presents the outcomes of oral hygiene and periodontal health assessments in

children with and without ASD. Notably, a slightly higher percentage of children with ASD (10.7%) exhibited moderate oral hygiene compared to those without ASD (3.3%). Additionally, a minority of children with ASD (3.6%) reported poor oral hygiene, whereas none of their counterparts fell into this

category (0.0%). However, these differences did not reach statistical significance respectively ($p = 0.22$ and $p = 0.7$). Analysis of the MGI revealed that children with ASD exhibited a higher prevalence of moderate inflammation (3.6%) compared to their peers without ASD (0.0%). Similarly, based on the sBPE, children with ASD demonstrated a higher percentage of bleeding on probing (67.9%) and calculus deposits (28.6%) compared to their counterparts (60.0% and 20.0%, respectively). Despite these observations, the result did not achieve statistical significance ($p = 0.18$). Further investigations may be warranted to discern potential contributing factors to these oral health indicators in children with ASD.

Discussion

This study aimed to evaluate the oral health status of children with autism spectrum disorder (ASD) in comparison to children without ASD, focusing on oral hygiene, caries, and periodontal status. The findings provide valuable insights into the unique challenges faced by children with ASD in maintaining oral health. The study's results, as reflected in Table 2, demonstrated a contrasting caries experience between children with and without ASD. Notably, the DMFT index revealed a trend towards higher caries prevalence in children with ASD, contradicting earlier studies by Morales-Chavez et al. (17) and Fakroon et al. (18), which reported lower caries incidence in children with ASD.

However, our results aligned with a systematic review suggesting elevated caries risk in children with ASD, potentially linked to challenges in oral hygiene practices (12). Difficulties in toothbrushing and flossing, coupled with limited manual dexterity, may contribute to the observed higher caries risk in this population (25). The OHI-S findings revealed a higher percentage of children with ASD exhibiting moderate to poor oral hygiene compared to their counterparts. This outcome is consistent with previous studies highlighting a prevalence of moderate and visible dental plaque in children with ASD (17, 19, 26-28). The preference for chewy and sticky foods among children with ASD, leading to prolonged food retention and increased plaque accumulation, may contribute to these observations (29, 30).

The assessment of periodontal health using the Modified Gingival Index (MGI) and Simplified Basic Periodontal Examination (sBPE) provided additional insights. Despite a lower mean dmft in children with

ASD, they exhibited moderate inflammation. This aligns with studies reporting significant increases in plaque index, gingival index, and Community Periodontal Index of Treatment Needs (CPITN) scores in children with ASD (19, 31). The sBPE findings suggested a higher prevalence of bleeding on probing and calculus deposits in children with ASD, potentially linked to difficulties in managing oral hygiene at home (2). The study emphasises the importance of collaborative efforts involving parents, dental teams, occupational therapists, and healthcare professionals to address these challenges comprehensively.

The small sample size in this study warrants consideration when interpreting the findings and generalising the results. The challenges associated with recruiting and conducting dental examinations on children with autism spectrum disorder (ASD) are multifaceted and may have contributed to the limited sample size. Firstly, accessing a sufficient number of children with ASD who are willing to participate in dental research can be difficult due to the sensory sensitivities and communication barriers commonly associated with the condition. Additionally, the need for specialised dental facilities equipped to accommodate the unique needs of children with ASD, such as sensory-friendly environments and trained personnel, further complicates recruitment efforts. In some cases, comprehensive examinations required multiple visits or were conducted during surgery for those undergoing treatment under general anaesthesia. The exaggerated aversive responses expressed by children with ASD during dental visits underscore the need for a patient-centred approach and tailored interventions to ensure optimal oral health care.

It is important to acknowledge that the small sample size may have impacted the statistical power of the study, potentially limiting the ability to detect smaller, yet clinically significant differences between groups. Furthermore, the heterogeneity within the ASD population, including variations in symptom severity and comorbid conditions, may have influenced the observed oral health outcomes. Future research with larger and more diverse samples of children with ASD is warranted to validate and expand upon the current findings.

Conclusion

Despite the study's limitations, the findings shed light on the oral health challenges faced by children with

ASD. The elevated caries risk, compromised oral hygiene, and distinct periodontal issues highlight the need for targeted interventions and collaborative care. Future research should explore effective strategies for improving oral health outcomes in this population, considering the unique sensory and behavioural aspects associated with autism spectrum disorder.

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Competing interests

The authors declare that they have no competing interests.

Ethical Clearance

We obtained approval from the UiTM Research Ethics Committee (REC), dated 2 December 2021, with reference number REC/07/2021 (FB/45).

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