ORAL HYGIENE PRACTICE AND PERIODONTAL STATUS OF STUDENTS AT SPECIAL NEEDS BOARDING SCHOOLS IN KUANTAN, PAHANG, MALAYSIA

Nor Asilah Harun
Department of Paediatric Dentistry and Dental Public Health,
Kulliyyah of Dentistry, International Islamic University Malaysia,
Kuantan Campus, Bandar Indera Mahkota, 25200 Kuantan, Pahang, Malaysia
Email: norasilah@iium.edu.my

Munirah Yaacob
Periodontic Unit, Department of Restorative Dentistry,
Kulliyyah of Dentistry, International Islamic University Malaysia,
Kuantan Campus, Bandar Indera Mahkota, 25200 Kuantan, Pahang, Malaysia
Email: mun_ira@iium.edu.my

Norzaiti Mohd Kenali
Department of Paediatric Dentistry and Dental Public Health,
Kulliyyah of Dentistry, International Islamic University Malaysia,
Kuantan Campus, Bandar Indera Mahkota, 25200 Kuantan, Pahang, Malaysia
Email: drzaiti@iium.edu.my

Mohamad Shafiq Mohd Ibrahim
Department of Paediatric Dentistry and Dental Public Health,
Kulliyyah of Dentistry, International Islamic University Malaysia,
Kuantan Campus, Bandar Indera Mahkota, 25200 Kuantan, Pahang, Malaysia
Email: shafiq@iium.edu.my

Sarah Syuhadah Mohd Sopie
Klinik Pergigian Gemencheh,
73200 Gemencheh, Negeri Sembilan, Malaysia.
Email: sarahsyuhadah@gmail.com

Farah Aqilah Kamaluddin
Klinik Pergigian Batu 2.5,
Jalan Air Putih, 24000 Kemamam, Terengganu
Email: farahkamaluddin60@gmail.com

ABSTRACT

People with disabilities are one of the most vulnerable minority groups to health care or rehabilitation services deficiencies. Previous studies have demonstrated that they suffered from poor oral hygiene and a higher incidence of periodontal disease as a consequence. Students at special needs boarding schools reside in the school hostel, where they are looked after by wardens. Therefore, this study aims to assess the oral hygiene practices and periodontal status among visually impaired, hearing and intellectually disabled students at special needs boarding schools in Kuantan, Pahang, Malaysia. Demographic information and oral hygiene practice were recorded for each participant aged between 7 to 20 years old. Periodontal status was assessed during an oral examination using the Basic Periodontal Examination (BPE) score as a basic screening method. The periodontal disease prevalence was 97.7%, with most of them having bleeding gingiva and calculus (70.3%). 58.6% of students with a learning disability had bleeding gum and calculus, but no significant association between periodontal health status with types of disabilities was noted. Most participants claimed to practice proper oral hygiene, although periodontal disease developed. This showed that individuals had difficulty putting it into practice despite knowing about oral hygiene practice, owing to a lack of basic manual skills and intellectual ability. Hence, proper oral health education and preventive strategy must be implemented according to the types of disability. Thus, they need help from special education teachers and trained individuals. At boarding schools or institutions for children with disabilities, policies and specialised oral health care programmes for caregivers should be empowered to strengthen the caregiver's knowledge and practice to assist the children with disabilities under their care.

Key words: Children with disabilities, oral health, oral hygiene, periodontal disease

INTRODUCTION

Disability, the umbrella term for impairments, activity limitations, and participation restrictions, refers to the interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors) (WHO, 2001). Globally, over one billion people of the world's population suffer from some form of disability, of which nearly 466 million have a hearing disability, 70 million have a visual impairment, and 2.3 million children have learning disabilities (Marbeley *et al*., 2006, WHO, 2020). In Malaysia, of the 453,258 registered people with disabilities in 2017, 34.8% had learning

disabilities, 8.9% had visual impairment, 7.6% had a hearing impairment, and 0.5% fell into the speech impairment category (Malaysian Department of Social Welfare, 2017).

People with disabilities can be considered one of the most vulnerable minority groups and have been recognized as one of the priority groups in Malaysia, particularly to deficiencies in services such as health care, rehabilitation, or support and assistance (MOH, 2004, WHO, 2011). Dental care is the most common unmet health care need of children with disabilities (Mouradian, 2001, Lewis, 2009, Nelson *et al*., 2011). Children with mental, developmental, or physical impairments cannot always understand and assume responsibility for their own oral hygiene activities (Butani *et al*., 2009). The inability of the children to understand, see and learn to perform routine dental care for themselves is correlated with the high prevalence of caries and periodontal disease. Therefore, some depend on a parent or care provider for daily oral hygiene activities depending on their ability (Siklos *et al*., 2007, Butani *et al*., 2009). Due to parents' extra responsibilities with disabilities, dental care is the least of the families' priorities.

Periodontal disease is an infection caused by poor dental hygiene and an inability to maintain good oral health. Everyone, including individuals with disabilities, goes through the same stages of acquiring the gingival or periodontal disease. Plaque is the first step in the progression of periodontal disease. Gingivitis, calculus, and periodontitis will develop if the plaque is not removed. Compared to children of the same age who do not have disabilities, plaque control in children with disabilities is typically poor resulted in poor oral hygiene (John *et al*., 2017). The inability to remove plaque from tooth surfaces is the key factor leading to periodontal disease development in people with disabilities (Kumar *et al*., 2008). A study among teenagers with special needs in India showed poor oral hygiene and a high incidence of periodontal disease, which may be attributed to their lack of coordination, understanding, physical disability, or muscular limitations (Ameer *et al*., 2012).

Periodontal disease, also known as gum disease, develops in phases, destroying the gum tissue and ligaments that attach the teeth to the bone, eventually damaging the bone that anchors the tooth and resulting in tooth loss. Bad breath or a strange taste in the mouth are two symptoms (Perlman *et al*., 2008). Periodontal disease also will lead to gum infection and swelling, and in worse scenarios, caused swelling of the face, oral pain, and systemic infection. Individuals with disabilities quality of life may be affected further (Brown, 2009).

Special needs schools, institutions, and community-based rehabilitation centers for children with disabilities exist in Malaysia. Because most schools and centers are in the city, the Ministry of Education has established a special needs boarding school where children with disabilities from rural areas can remain at the school hostel starting at the age of seven and be cared for by the school's warden. Data concerning the periodontal health condition of children with disabilities are scarce in Malaysia, with most reports focusing on dental caries. There was no data reported about the periodontal status of children with special needs at special needs boarding schools. A study in Negeri Sembilan reported a high prevalence of caries, with 52.8% of the children requiring dental treatment (Mokhtar *et al*., 2016). Another study reported satisfactory oral health status (caries status and orthodontic treatment needed) but highlighted the lack of oral hygiene awareness among the special needs in a special education integrated program in Kuala Lumpur (John *et al*., 2017). An earlier study found that the periodontal disease prevalence was high (86.8%) among children with special needs from Kota Bharu schools (Alsanabani *et al*., 2012). Therefore, the purpose of this study was to determine the oral hygiene practices and periodontal health status of children with disabilities who attended special needs boarding schools and their association.

MATERIALS AND METHODS

A cross-sectional study was conducted from April to July 2017 using the voluntary non-probability sampling method. Ethical approval from the IIUM Research Ethics Committee (ID NO. 697) and permission from the Ministry of Education, Malaysia (Ref. no. KPM.600-3/2/3 Jld) was obtained prior to data collection.

Students from two special needs boarding schools in Kuantan, Pahang, Malaysia, were the study population. In Pahang, there were only two special needs boarding schools, one for primary school students and the other for secondary school students. The majority of the participants had a learning disability, while the rest had a visual or hearing disability.

The participant's parents or guardians were provided with detailed information on the study protocol. After obtaining parental or guardian consent, the participants' periodontal condition was assessed during an oral examination while seated on a portable dental chair. Under portable dental light, two paediatric dental specialists used a dental mouth mirror and a WHO periodontal probe to do the examination. The Basic Periodontal Examination (BPE) score was used to measure the periodontal condition of each participant's permanent tooth in all six quadrants as a basic screening method. The inter and intra-examiner reliability, as measured by Cohen's Kappa, was greater than 0.8, indicating a high level of agreement.

The students were allocated into three groups based on their disability: learning, hearing, and visual. They were also divided into three age groups: 7-12 years old, 13-15 years old, and 16-20 years old. Socio-demographic information such as name, age, type of disability, oral hygiene practices, and history of dental problems was distributed to participants and completed with the help of teachers and caretakers.

The data obtained were converted to percentages. Mann-Whitney and Kruskal-Wallis tests were conducted using IBM SPSS 25 to determine the association of periodontal health status between age groups, type of disabilities, and oral hygiene practice. The level of significance was set at $p < 0.05$.

RESULT

A total of 263 students were included in this study, ranging from 7 to 20 years old. The majority of the students (80.2%) were in the learning disability group, and 3% (8) had both learning and hearing disabilities, and one student had all three disabilities (Table 1).

Table 1. Types of disabilities of the participants

Age group (year)	Type of disabilities n (%)				
	Learning	Hearing	Visual	Hearing & learning	Hearing, Learning & Visual
7-12	12 (4.6)	13 (4.9)	4 (1.5)	8 (3.0)	1 (0.4)
13-15	3 (1.1)	4 (1.5)	0 (0)	0 (0)	0 (0)
16-20	196 (74.5)	22 (8.4)	0 (0)	0 (0)	0 (0)
Total	211(80.2)	39 (14.8)	4(1.5)	8 (3.0)	1(0.4)

Most of the students used fluoridated toothpaste (98.1%), with 63.2% brushing their teeth in less than two minutes. 6.5% of the students brushed their teeth less than twice a day, and 82.9% brushed without supervision. 67.2% of them had a history of dental pain, bleeding gums, or swelling. Only 2.3% of the students had a healthy periodontal condition. The periodontal disease prevalence was 97.7%, with most of them having bleeding gingiva and calculus (70.3 %). The demographic details, oral hygiene practice, and periodontal status of the participants are shown in Table 2.

Table 2. Socio-demographic and oral hygiene practice of participants

Socio-demographic profile and oral hygiene practice	n (%)
Age groups	
(7-12)	38 (14.4)
(13-15)	7 (2.7)
(16-20)	218 (82.9)
School	
Primary	44 (16.7)
Secondary	219 (83.3)
Frequency of daily toothbrushing	
Once	17 (6.5)
Twice	158 (60.0)
Thrice	88 (33.5)
Time of toothbrushing	
AM	33 (12.6)
PM	2 (0.8)
AM & PM	227 (86.6)
Duration of toothbrushing	
Less than 2 minutes	165 (63.2)
More than 2 minutes	96 (36.8)
Supervision toothbrushing	
No	218 (82.9)
Monitor only	43 (16.3)
Help in Brushing	2 (0.8)
Change toothbrush every 3 months	
Yes	45 (17.4)
No	213 (82.6)
Type of toothpaste	
Fluoridated	258 (98.1)
Non-fluoridated	3 (1.1)
Other	2 (0.8)
Amount of toothpaste	
Pea-size	137 (52.3)
More than pea-size	119 (45.4)
Other	6 (2.3)
Dental Check-Up	
Never	1 (0.4)
Once a Year	260 (99.6)
Dental pain/gum swelling	
Yes	177 (67.2)
No	86 (32.7)

Even though bleeding gingiva and calculus mainly occurred in the 16 to 20 years old age group (59.7%), there was no significant association between age and periodontal health status (Table 3).

Table 3. Periodontal status according to age group

Age (Year)	Periodontal status, n (%)				*P*-value
	Healthy n (%)	Bleeding Gum n (%)	Bleeding Gum + Calculus n (%)	BG + C+ Pocket + 3.5-5.5 n (%)	
7-12	0 (0)	14 (5.3)	24 (9.1)	-	0.082
13-15	0 (0)	2 (0.8)	5 (1.9)	0 (0)	
16-20	6 (2.3)	42 (16.0)	156 (59.3)	14 (5.3)	
Total	6 (2.3)	58 (22.1)	185(70.3)	14 (5.3)	-

BG= Bleeding gum, C= calculus

Table 4 compares the periodontal status among different disability groups using the Mann-Whitney test. 58.6% of the students with a learning disability had bleeding gums and calculus, but there was no association between periodontal health status with types of disability.

Table 4. The periodontal status with different disability group

Type of Disabilities	Healthy n (%)	Bleeding Gum n (%)	Bleeding Gum + Calculus n (%)	BG + C+ Pocket + 3.5-5.5 n (%)	*p*-value
Learning	5(1.9)	40(15.2)	154(58.6)	12(4.6)	
Hearing	1(0.4)	15(5.7)	21(8.0)	2(0.8)	0.072
Hearing & Learning	0	2(0.8)	6(2.3)	0	
Hearing, Learning and Visual	0	1(0.4)	0	0	

BG= Bleeding gum, C= calculus

As listed in Table 5, there was no significant association between oral hygiene practice with periodontal health status. Despite brushing three times a day, brushing more than two minutes, and changing toothbrushes every three months, the participants still had severe periodontal problems.

Table 5. The association of oral hygiene practice and periodontal health status

Oral Hygiene Practice	Healthy n (%)	Bleeding Gum n (%)	Bleeding Gum + Calculus n (%)	BG + C+ Pocket + 3.5-5.5 n (%)	*p*-value
Frequency Toothbrushing per day					
One time	1 (5.9)	6 (35.3)	9 (52.9)	1 (5.9)	0.064[a]
Two time	2 (1.3)	28 (17.6)	119 (74.8)	10 (6.3)	
Three time	3 (3.4)	24 (27.6)	54 (62.1)	6 (6.9)	
Duration toothbrushing					
Less than 2 minutes	2 (1.2)	34 (20.6)	120 (72.7)	9 (5.5)	0.477[b]
More than 2 minutes	4 (4.2)	23 (24)	61 (63.5)	8 (8.3)	
Supervision toothbrushing					
No	6 (2.8)	42(19.3)	156 (71.6)	14 (6.4)	0.288[a]
Monitor only	0	16(37.2)	24(55.8)	3(7.0)	
Help in Brushing	0	0	2(100)	0	
Change toothbrush every 3 months					
No	4(1.9)	44(20.7)	150(70.4)	15(7.0)	0.062[b]
Yes	2(4.4)	14(31.1)	27(60.0)	2(4.4)	

[a]Kruskal Wallis, [b]Mann Whitney, BG= Bleeding gum, C= calculus

DISCUSSION

In this study, the periodontal disease prevalence was high, and only 2.3% of the participants had healthy gingival. This finding was consistent with previous studies, which showed a poor level of oral hygiene and a high prevalence of periodontal disease among individuals with disabilities (Jain *et al.*, 2009, Al Habashneh *et al.*, 2012, Alsanabani *et al.*, 2012, Morgan *et al.*, 2012). Bleeding gingiva with calculus (BPE score 2) occurred most frequently among participants in this study, followed by bleeding

gingiva with no calculus (22.1%) and bleeding gingiva with calculus and pocketing of 3.5 to 5.5 mm (6.5%), which was in line with a study by Alsanabani *et al.*, 2012. Calculus occurred in 75.5% of the participants and was the major contributing factor for periodontal disease in this study, showing that the vast majority of students from special needs schools in this study had periodontal disease and required treatment. 6.5% of the students had a BPE score of 3, indicating that they needed further detailed periodontal charting and management by specialists (BSP, 2019).

It is not simply the presence of the disability that is important; the type of disability also impacts oral health. (Lee *et al.*, 2019. Bimstein et al. (2014) found that those with a visual disability had a statistically higher incidence of gingivitis than people with hearing impairments, owing to their greater reliance on caregivers. A study in Yemen also showed similar results where the group with visual impairment had the highest plaque index and gingival index score, while those with hearing impairment had the lowest score. They concluded that children with disabilities had poor oral hygiene (Al-Maweri and Zimmer, 2015). However, there was no significant variation in periodontal status among the various categories of disabilities in this study. The majority of the participants in this study remained in the school hostel beginning at the age of seven for primary school and were cared for by their school teachers or warden. This could be a potential explanation for their high prevalence of periodontal disease due to inadequate caretaker supervision.

In this study, the oral hygiene practice of participants was assessed using a self-reported questionnaire. No significant association was found between oral hygiene practices with periodontal disease. The majority of participants claimed to practice proper oral hygiene, although periodontal disease nevertheless developed. This showed that, despite knowing about oral hygiene practice, individuals had difficulty putting it into practice, owing to a lack of basic manual skills and intellectual ability (Waldron *et al.*, 2019).

Hence, proper oral health education and preventive strategy must be implemented according to the types of disability, which can prove challenging. For example, to educate visually impaired individuals, explicit verbal instruction with tactile stimuli is required (Ganapathi *et al.*, 2015). Furthermore, communication is the major hindrance in the hearing-impaired group in obtaining access to oral health education. Thus, they need help from special education teachers and trained individuals (Oredugba *et al.*, 2004). Individuals with learning/intellectual disabilities often face difficulty understanding the importance of oral hygiene and correlating it with oral hygiene practices. Therefore, more attention and accurate preventive measures are needed for this group (Relwani *et al.*, 2016).

Caretakers also play an important role in assisting with oral hygiene efforts as individuals with disabilities may be partially or wholly dependent on them. This was also proven in previous studies where the active involvement of parents and caregivers reduced oral health problems (Pareek *et al.*, 2015). With an increasing number of people with disabilities, continuing the oral health education program is especially crucial for parents and caretakers. School teachers and caretakers at special needs boarding schools and centers require proper training and practical support with the help of experienced health care professionals to take care of individuals with disabilities (Ameer *et al.*, 2012). At boarding schools or institutions for children with disabilities, policies and specialised oral health care programmes for caregivers should be empowered to strengthen the caregiver's knowledge and practice in order to assist the children with disabilities under their care. Moreover, health care providers must have good communication and management skills to work with individuals with disabilities. These comprehensive measures ensure that individuals with disabilities get the best oral health care and improve their quality of life. They deserve the same opportunities as those who are healthy.

CONCLUSION

In this study, students with disabilities had a high prevalence of periodontal disease and the need for periodontal care. There was no significant association between periodontal disease and oral hygiene practice, age, or type of disabilities. Disability results from impairment and deprivation of these groups have resulted in poor oral hygiene and consequent periodontal diseases.

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REFERENCES

Ameer N, Palaparthi R, Neerudu M, Palakuru SK, Singam HR, Durvasula S. (2012). Oral hygiene and periodontal status of teenagers with special needs in the district of Nalgonda, India. *Journal of Indian Society of Periodontology*. Jul;16(3):421-5.

Alsanabani A, Noorliza M Ismail, Abdul R Ismail, Helmi A Alyamani, Mon Mon Tin Oo (2012). Periodontal Status and Its Relationship with Socio-demographic Factors among Special Needs Children in Schools of Kota Bharu, Kelantan. *Malaysia International Medical Journal*. March; 19(1): 66 – 69.

Al Habashneh R, Al-Jundi S, Khader Y, Nofel N (2012). Oral health status and reasons for not attending dental care among 12- to 16-year-old children with Down syndrome in special needs centres in Jordan. *International Journal Dental Hygiene.* Nov;10(4):259-64.

Al-Maweri SA, Zimmer S (2015). Oral Health Survey of 6-14-Year-Old Children with Disabilities Attending Special Schools Yemen. *Journal of Clinical Pediatric Dentistry.* Spring;39(3):272-6.

Ameer N, Palaparthi R, Neerudu M, Palakuru SK, Singam HR, Durvasula S (2012). Oral hygiene and periodontal status of teenagers with special needs in the district of Nalgonda, India. *Journal of Indian Society of Periodontology.* Jul-Sept; 16:421-5.

Bimstein E, Jerrell RG, Weaver JP, Dailey L (2014). Oral characteristics of children with visual or auditory impairments. *Pediatric Dentistry*. Jul-Aug;36(4):336-41.

British Society of Periodontology. Basic Periodontal Examination (BPE) Guideline (2019). Available from: https://www.bsperio.org.uk/publications/downloads/115_170601_a115_090048_bsp-bpe-guidelines-2019.pdf

Brown A. (2009). Caries prevalence and treatment needs of healthy and medically compromised children at a tertiary care institution in Saudi Arabia. *Eastern Mediterranean Health Journal.* 15(2), 378-86

Butani Y, Gansky SA, Weintraub JA (2009). Parental perception of oral health status of children in mainstream and special education classroom. *Special Care Dentistry.* Jul-Aug;29(4):156-62.

Dental Services Division, Ministry of Health Malaysia (2004). Oral health care for Children with special needs: Guideline for Implementation. Available from http://ohd.moh.gov.my/images/pdf/xtvtnsop/Oral-Healthcare-for-Children-with-Special-Needs-Guidelines-for-Implementation-2004.pdf

Ganapathi AK, Srinivas Namineni, Phani Himaja Vaaka, Vamsilatha K, Rupali Das, Maruti Devi, Anitha Akkaloori, Aravind Kumbakonam (2015). Effectiveness of Various Sensory Input Methods in Dental Health Education Among Blind Children- A Comparative Study. *Journal Clinical Diagnostic Research*. Oct; 9(10): ZC75–ZC78.

Jain M, Anmol Mathur, Leena Sawla, Geeta Choudhary, Komal Kabra, Prabu Duraiswamy and Suhas Kulkarni (2009). Oral health status of mentally disabled subjects in India. *Journal of Oral Science*. Vol. 51, No. 3, 333-340

John J, Mani SA, Joshi V K, Kuan L Y, Lim H W, Wan-Lin L, Shoaib L A and Omar R A (2017). Oral health status and treatment needs of school children undergoing special education integrated programme in Malaysia – a pilot study. *Journal of Disability and Oral Health*. April; 18(2) :53-60

Kumar S, Dagli RJ, Mathur A, Jain M, Duraiswamy P, Kulkarni S. (2008). Oral hygiene status in relation to socio-demographic factors of children and adults who are hearing impaired, attending a special school. *Special Care Dentistry,* 28(6), 258-64.

Lewis CW (2009). Dental care and children with special health care needs: a population-based perspective. *Academic Pediatrics*; 9(6):420-6.

Lee JY, Lim KC, Kim SY, Paik HR, Kim YJ, Jin BH (2019). Oral health status of the disabled compared with that of the non-disabled in Korea: A propensity score matching analysis. *PLoS One*. Jan 14;14(1)

Maberley DA, Hollands H, Chuo J, Tam G, Konkal J, Roesch M, Veselinovic A, Witzigmann M, Bassett K (2006). The prevalence of low vision and blindness in Canada. Eye (Lond). ;20(3):341-6.

Malaysia Department of Social Welfare (2017). Available from https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=152&bul_id=NU5hZTRkOSs0RVZwRytTRE5zSitLUT09&menu_id=U3VPMldoYUxzVzFaYmNkWXZteGduZz09

Mokhtar SM, L. Abd Jalil, N. Muhd Noor, B. C. Tan, Z. Shamdol, H. Ali Hanafiah (2016). Dental Status and Treatment Needs of Special Needs Children in Negeri Sembilan, Malaysia. *World Journal of Research and Review*. June; 2(6): 64-70.

Morgan JP, Minihan PM, Stark PC, Finkelman MD, Yantsides KE, Park A, Nobles CJ, Tao W, Must A (2012). The oral health status of 4,732 adults with intellectual and developmental disabilities. *Journal of the American Dental Association.* Aug:143(8):838-46.

Mouradian WE (2001). The face of a child: Children's oral health and dental education. *Journal of Dental Education.* Sep;65(9):821-31.

Nelson LP, Anne Getzin, Dionne Graham, Jing Zhou, Elke M Wagle, Jessie McQuiston, Suzanne McLaughlin, Akshay Govind, Matthew Sadof, Noelle L Huntington (2011). Unmet dental needs and barriers to care for children with significant special health care needs. *Pediatric Dentistry*. Jan-Feb 2011;33(1):29-36.

Oredugba FA. Oral health care knowledge and practises of a group of deaf adolescents in Lagos, Nigeria (2004). *Journal Public Health Dentistry*. 64(2):118–120.

Pareek S, Anup Nagaraj, Asif Yousuf, Shravani Ganta, Mansi Atri, Kushpal Singh (2015). Effectiveness of supervised oral health maintenance in hearing impaired and mute children- A parallel randomized controlled trial, *Journal of International Society of Preventive and Community Dentistry.* May-Jun; 5(3):176-82.

Perlman SP, Friedman C, Fenton SJ. (2008). A Caregivers Guide to Good Oral Health for Persons with Special Needs. *Special Olympics*, Inc.

Relwani AH, Kiran S, Bhatt R, Patel M (2016). Impact of Dental Health Education on "Specific Learning Needs" Children. *International Journal Clinical Pediatric Dentistry*. Jan-Mar;9(1):31-4.

Siklos S, Kerns KA. (2007). Assessing the diagnostic experiences of a small sample of parents of children with autism spectrum disorders. *Research In Developmental Disabilities*; 28:9-22.

Waldron C, Nunn J, Mac Giolla Phadraig C, Comiskey C, Guerin S, van Harten MT, Donnelly-Swift E, Clarke MJ. (2019). Oral hygiene interventions for people with intellectual disabilities. *Cochrane Database Syst Rev*. 2019 May 31;5(5)

World Health Organization (WHO) (2011). World Report on Disability 2011.

World Health Organization (WHO) (2020). Deafness and hearing loss. https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss .

World Health Organization (2008). The global burden of disease: 2004 update. Geneva.