COMPARISON OF ORAL HEALTH BETWEEN CHILDREN AGED 11-13 YEARS IN NEPAL WITH AND WITHOUT DISABILITIES

Bandana Pathak[1], Yaowaluk Ngoenwiwatkul[1], Samrit Srithamrongsawat[2] and Pimsurang Taechaboonsermsak[3]

[1]Department of Community Dentistry, Faculty of Dentistry, Mahidol University; [2]Department of Community Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University; [3]Department of Family Health, Faculty of Public Health, Mahidol University, Bangkok, Thailand

Abstract. Children with disabilities may be more likely to experience oral health problems than children without disabilities but the prevalence of these oral health problems among school age children in Nepal with disabilities is unclear. In this study, we aimed to compare oral health between children in Nepal with and without disabilities in order to determine if there is a disparity between the two groups and to what extent in order to develop oral health promotion programs for this study population. Study subjects were randomly selected from children aged 11-13 years attending 4 public schools, 3 schools for students with disabilities and 1 school for students without disabilities in Province 3, Nepal. Demographic and health data were obtained from each child and a dental examination was conducted using a mouth mirror and probe following World Health Organization methods. A total of 158 children were included in the exam: 79 with and 79 without disabilities. The mean (±standard deviation (SD)) ages of subjects with and without a disability were 12 (±1) and 12 (±1) years (p = 0.847); 47% and 54% (p = 0.426) male, respectively. The percentages of study subjects with and without a disability who had dental caries experience were 76% and 66%, respectively (p = 0.220). The percentages of subjects with and without a disability who had teeth with untreated dental decay were 62% and 54%, respectively (p = 0.420). The percentages of subjects with and without a disability who had missing teeth were 22% and 10%, respectively (p = 0.080). The percentages of subjects with and without a disability who had filled teeth were 24% and 27%, respectively (p = 0.855). The mean (±SD) decayed, missing and filled teeth (DMFT) scores among study subjects with and without a disability were: 3.1 (±2.5) and 2.6 (±2.6), respectively (p = 0.237). The percentages of subjects with and without a disability who had good oral hygiene were 9% and 33%, respectively

(p <0.001). The percentages of subjects with and without a disability who had not visited a dentist in the previous 12 months were 75% and 58%, respectively (p = 0.043). In summary, study subjects with a disability had significantly more dental problems and of greater severity than those without a disability. We conclude in our study population, there is a need for a program to promote dental health among children with a disability. Further studies are needed to determine which methods are effective to include in this dental health promotion program.

Keywords: dental caries, oral health, OHI-S, disability, missing teeth, gingivitis

Correspondence: Yaowaluk Ngoenwiwatkul, Department of Community Dentistry, Faculty of Dentistry, Mahidol University, 6 Yothi Road, Ratchathewi District, Bangkok 10400, Thailand
Tel: +66 (08) 5143 3754 E-mail: yaowaluk.ngo@gmail.com

INTRODUCTION

The United Nations Development Program has estimated there are approximately 650 million people worldwide who have a disability, 150 million of them are children and 30 million of these children live in South Asia (WHO, 2011; UNICEF, 2005; Thapaliya, 2016). Children with disabilities may be disadvantaged physically, mentally and socially (Sandeep *et al*, 2016). The most common disadvantage is the inability to maintain oral health (Ameer *et al*, 2012). Disabled children are more likely to be affected by oral disease, leading to a higher prevalence and severity of oral pathology (Prasad *et al*, 2018). The oral health of disabled children is often ignored by caretakers since they are usually more concerned with the child's overall health than their oral health (Sandeep *et al*, 2016; Al Sadhan *et al*, 2017; Wei *et al*, 2012; Shivakumar *et al*, 2017). This can lead to untreated caries and dental abscesses in children with disabilities.

Most previous studies of oral health among children with disabilities do not compare their oral health with that of children without disabilities (Shivakumar *et al*, 2017; Turkistani and Elmarsafy, 2019). The above studies covered children aged 6-27 years, which is a broad range, making it less comparable to 12-year-olds, the age group used for international comparisons (WHO, 1997). Few studies have compared the severity of oral health problems between children with and without disabilities (Al Sadhan *et al*, 2017; Prasad *et al*, 2018). Since the first oral health survey in Nepal (Yee *et al*, 2004), there has been only one

published study focusing solely on the oral health of disabled children in Nepal (Acharya *et al*, 2014).

In this current study, we aimed to compare oral health between children aged 11-13 years with and without disabilities in Nepal in order to determine if there is a disparity between the two groups and to what extent, in order to develop an oral health program for this study population.

MATERIALS AND METHODS

Study population

The children with disabilities were recruited from 3 schools in Province 3, Nepal: 1 school for the visually impaired, 1 school for the hearing impaired and 1 school for the orthopedically impaired. These were compared to children without disabilities who were recruited from 1 public school in Province 3, Nepal. Students aged 11-13 years at the study schools were randomly recruited. Children who were unwilling or unable to participate or in whom informed parental consent could not be obtained were excluded from the study.

Sample size determination

The minimum number of children determined to be necessary for the study was calculated based on a previous study evaluating the prevalence of dental caries among children with disabilities, which was reported to be 98.3% (Acharya *et al*, 2014). We selected a 3% margin of error and a 95% confidence interval (CI). We assumed a dropout rate of 9%. This resulted in the minimum calculated number of study subjects needed for each of the two groups, those with and those without disabilities, to be 79.

Data collection

Each subject was asked about demographic characteristics and selected data related to the history of gum bleeding, use of fluoride toothpaste and dental visits using a structured questionnaire. Each subject then underwent a dental examination following the methods of the World Health Organization (WHO, 1997). The dental examination evaluated for the presence of untreated dental decayed (D), missing (M) teeth (T) and filled (F) teeth (T) and a DMFT score was then recorded. We assessed oral hygiene using the simplified oral hygiene index (OHI-S) evaluating for the presence of debris (DI-S) and calculi (CI-S); the sum of the DI-S and CI-S scores was used to calculate the OHI-S score with a total possible score ranging from 0-6 points. The criteria for classifying OHI-S score were as follows: oral hygiene was considered "good", "fair", and "poor" if the OHI-S scores were ≤1.2, 1.3-3.0 and 3.1-6.0, respectively (Greene and Vermillion, 1964). We also used the Carter and Barnes Index (CBI) to classify gingival bleeding by using dental floss (Carter and Barnes, 1974). The CBI specifies the location of gingival bleeding and can inform

schoolchildren of their oral health status. The dental examiner underwent training followed by an examination under field conditions to ensure the oral examinations were conducted following World Health Organization guidelines (WHO, 1997).

Statistical evaluation

We used descriptive statistics, means and standard deviations to evaluate DMFT and OHI-S scores, the Chi-square, Fisher's exact test and the T-test to evaluate differences between those with and without disabilities. A p-value <0.05 was considered statistically significant. We used the Statistical Package for Social Sciences (SPSS), version 18.0 to perform the statistical analyses (IBM, Chicago, IL).

Ethical considerations

This study was approved by the Ethics committee of the Institutional Review Board, Mahidol University (MU-DT/PY-IRB No:78.0517/EC441) and the Nepal Health and Research Council (Reg. no 317/2019) and followed the principles of the Helsinki Declaration. Written informed consent was obtained from all study subjects and their parents or guardians prior to inclusion in the study.

RESULTS

A total of 158 children were included in the study: 79 with and 79 without disabilities. Of the 79 subjects with disabilities, 58% had an orthopedic disability, 25% had a hearing or speech disability and 17% had a visual disability.

The mean (±standard deviation (SD)) ages of subjects with and without a disability were 12 (±1) and 12 (±1) years (p = 0.847); 47% and 54% (p = 0.426) male, respectively (Table 1).

Table 1

Selected characteristics of study subjects

Characteristics	Subjects with disabilities (n = 79)	Subjects without disabilities (n = 79)	p-value
Percent of male subjects	47%	54%	0.426
Mean (±SD) age of male study subjects	12 (±1)	12 (±1)	0.805
Mean (±SD) age of female study subjects	12 (±1)	12 (±1)	0.702
Total	12 (±1)	12 (±1)	0.847

SD: standard deviation

The percentages of subjects with and without disabilities who had dental caries were 76% and 66%, respectively ($p = 0.220$). The percentages of subjects with and without disabilities who had untreated dental decay were 62% and 54% ($p = 0.420$), respectively. The percentages of subjects with disabilities who had good, fair and poor oral hygiene were 9%, 75% and 17%, respectively, and without disabilities were 33%, 63% and 4%, respectively ($p < 0.001$, $p = 0.169$, $p = 0.015$, respectively) (Table 2).

The percentages of subjects with and without a disability who had dental decayed were 62% and 54%, respectively ($p = 0.420$). The percentages of subjects with and without disabilities who had missing teeth were 22% and 10%, respectively ($p = 0.08$). The percentages of subjects with and without disabilities who had filled teeth were 24% and 27%, respectively ($p = 0.855$). The mean (±SD) DMFT scores among study subjects with and without disabilities were: 3.1 (±2.5) and 2.6 (±2.6), respectively ($p = 0.237$). The mean (±SD) D scores among subjects with and without disabilities were 1.9 (±2.2) and 1.6 (±2.0), respectively ($p = 0.310$). The mean (±SD) M scores among subjects with and without disabilities were 0.5 (±1.1) and 0.1 (±0.4) ($p = 0.006$). The mean (±SD) F scores among subjects with and without disabilities were 0.6 (±1.3) and 0.9 (±1.8), respectively ($p = 0.327$) (Table 3).

The mean (±SD) OHI-S scores among subjects with and without disabilities were 2.3 (±0.9) and 1.6 (±0.7), respectively ($p < 0.001$).

Table 2

Proportions of study subjects with and selected characteristics

Characteristics	Subjects with disabilities ($n = 79$)	Subjects without disabilities ($n = 79$)	p-value
Dental caries	76%	66%	0.220
Untreated dental caries	62%	54%	0.420
OHI-S			
Good	9%	33%	<0.001*
Fair	75%	63%	0.169
Poor	17%	4%	0.015*

OHI-S: oral hygiene index-simplified

*Significant at $p < 0.05$

Table 3

Decayed, Missing and Filled teeth scores among study subjects

Characteristics	Subjects with disabilities (n = 79)	Subjects without disabilities (n = 79)	p-value
Percent with D	62%	54%	0.420
Percent with M	22%	10%	0.080
Percent with F	24%	27%	0.855
Mean (±SD) D score	1.9 (±2.2)	1.6 (±2.0)	0.310
Mean (±SD) M score	0.5 (±1.1)	0.1 (±0.4)	0.006*
Mean (±SD) F score	0.6 (±1.3)	0.9 (±1.8)	0.327
Mean (±SD) DMFT score	3.1 (±2.5)	2.6 (±2.6)	0.237

D: Decayed teeth; DMFT: Decayed, Missing and Filled teeth; F: Filled teeth; M: Missing teeth; SD: standard deviation

*Significant at p <0.05

The mean (±SD) DI-S scores among subjects with and without disabilities were 1.5 (±0.4) and 1.2 (±0.3), respectively (p <0.001). The mean (±SD) CI-S scores among subjects with and without disabilities were 0.8 (±0.5) and 0.5 (±0.4), respectively (p <0.001) (Table 4).

The percentages of subjects with and without disabilities who had anterior bleeding gums were 49% and 30%, respectively (p <0.001), posterior bleeding gums were 70% and 42%, respectively (p <0.001) and both anterior and posterior bleeding gums were 57% and 35% (p <0.001), respectively (Table 5).

The percentages of subjects with and without disabilities, who used fluoride toothpaste were 47% and 20%, respectively (p <0.001), who had a dental visit in the previous 12 months were 25% and 42%, respectively (p = 0.043) and who complained of bleeding gums were 56% and 41%, respectively (p = 0.08) (Table 6).

DISCUSSION

The present study showed that the prevalence of dental caries among special needs children is 76%, which was greater than general public schoolchildren (66%); however, this difference was not statistically significant, unlike a previous study from India among children aged 12 years that reported subjects with disabilities (89.8%) had a significantly

Table 4

DI-S, CI-S and OHI-S scores among study subjects (N=158)

Characteristics	Subjects with disabilities (n = 79)	Subjects without disabilities (n = 79)	p-value
DI-S score, Mean (±SD)	1.5 (±0.4)	1.2 (±0.3)	<0.001*
CI-S score, Mean (±SD)	0.8 (±0.5)	0.5 (±0.4)	<0.001*
OHI-S score, Mean (±SD)	2.3 (±0.9)	1.6 (±0.7)	<0.001*

CI-S: calculus index-simplified; DI-S: debris index-simplified; OHI-S: oral hygiene index-simplified; SD: standard deviation

*Significant at p <0.05

Table 5

Gum bleeding (Gingivitis) found on examination among study subjects

Locations of gingival bleeding	Subjects with disabilities (n = 79)	Subjects without disabilities (n = 79)	p-value
Anterior teeth, n (%)			
Not bleeding	551 (51)	748 (70)	<0.001*
Bleeding	530 (49)	310 (30)	
Posterior teeth, n (%)			
Not bleeding	229 (30)	491 (58)	<0.001*
Bleeding	521 (70)	362 (42)	
Total, n (%)			
Not bleeding	780 (43)	1239 (65)	<0.001*
Bleeding	1051 (57)	672 (35)	
Total sites examined, n (%)	1831 (100)	1911 (100)	

*Significant at p <0.05

Table 6

Association between oral hygiene practices and disability status among study subjects

Oral hygiene practice	Subjects with disabilities (n = 79)	Subjects without disabilities (n = 79)	p-value
Use fluoride toothpaste, n (%)			
Yes	37 (47)	16 (20)	<0.001*
No	42 (53)	63 (80)	
Dental visits in past 12 months, n (%)			
Yes	20 (25)	33 (42)	0.043*
No	59 (75)	46 (58)	
Report of gum bleeding, n (%)			
Yes	44 (56)	32 (41)	0.080
No	35 (44)	47 (59)	

*Significant at p <0.05

greater (p <0.001) prevalence of dental caries than subjects without disabilities (58.6%) (Purohit and Singh, 2012). This difference between our study and the study from India could be because the majority of subjects in the study from India had primarily a mental disability, unlike our study subjects. Another reason why we did not see a significant difference in the prevalence of dental caries between those with and without disabilities could be because a large proportion of our subjects with disabilities used a toothpaste containing fluoride, which has been shown in children to reduce the prevalence of caries (Marinho *et al*, 2003).

The prevalence of dental caries among our subjects with disabilities (76%) was lower than that reported in a previous study from Nepal (98.3%) (Acharya *et al*, 2014). This could be because the subjects in this study were aged 11-13 years and in the study from Nepal were aged 12-15 years; the older the subjects were the more likely they were to develop caries. Moreover, this might be because more of our subjects used fluoride toothpaste than those in the study from Nepal, but this data was not recorded in their study.

According to the present study, there was no significant difference in the percentages of subjects with

and without disabilities who had untreated dental decay. This could be because significantly more of our subjects with disabilities used fluoride toothpaste than our subjects without disabilities. Previous studies did show a significant difference (Ward *et al*, 2019, Ningrum *et al*, 2021) but their study designs make them incomparable to our study subjects. In spite of this lack of difference in our study, the proportion of our study subjects who had untreated dental decay was high, both among those with and without disabilities, showing a possible problem with access to care or an attitude toward oral care among caregivers (da Rosa *et al*, 2020). In our study, significantly fewer subjects with disabilities had received dental care in the previous year than subjects without disabilities, similar to the findings of previous studies (Ningrum *et al*, 2021).

In the current study, there were no significant differences between the DMFT scores among subjects with and without disabilities, possibly due to the significantly greater proportion of subjects with disabilities who used fluoride toothpaste than the subjects without disabilities. Our findings are in contrast to those of a study from southern India (Purohit and Singh, 2012) where the mean DMFT score among subjects with disabilities was significantly greater than among subjects without disabilities. However, the mean DMFT scores and the severity and prevalence of dental caries among the non-disabled group in our study were higher than those reported in a study from southern India (Purohit and Singh, 2012) indicating the overall dental health among our study subjects, both with and without disabilities, was worse than the study from southern India. This same discrepancy was also seen in another study from India (Prasad *et al*, 2018).

When looking at the components of the DMFT score; in our study, we found no significant difference in the D scores between those with and without disabilities, unlike the findings of a previously compared study from southern India (Purohit and Singh, 2012). In the Southern India study, a similar percentage of the use of toothbrushes and toothpaste among children was reported in both groups (Purohit and Singh, 2012).

Our findings confirmed the M score was significantly greater among subjects with disabilities than among subjects without disabilities, similar to the results of previous studies from India (Sharma *et al*, 2019; Purohit and Singh, 2012) and similar to a previous meta-analysis (Ningrum *et al*, 2021). In addition, the M score was the only component of the DMFT score that was significantly greater among subjects with disabilities than subjects without disabilities. This suggested subjects with disabilities who had visited an oral health professional were more likely to have the tooth removed than to have it filled and this

suggested they were not brought to oral health professionals until they had an advanced stage of tooth decay that required removal instead of filling. This may reflect access problems (da Rosa *et al*, 2020). A study from the Netherlands reported communication problems between dentists and disabled children and noncooperation by the disabled children were important causes of poor dental care (de Jongh *et al*, 2008).

The study revealed no significant difference in the F scores between those with and without disabilities. This is due to poor oral care among both our study groups, those with and without disabilities as supported by our data. This finding was similar to the previously compared study from southern India that also found no significant difference in the F scores between those with and without disabilities (Purohit and Singh, 2012). The low F scores in both groups found in our study were similar to that reported by a previous meta-analysis study (Ningrum *et al*, 2021).

Furthermore, subjects with disabilities had significantly worse gingival health than subjects without disabilities. In our study, the percentage of subjects with disabilities who had good oral hygiene (9%) was lower than the percentages reported in studies from Iran (26.4%) (Ajami *et al*, 2007) and Indonesia (26.9%) (Nurliyanasari *et al*, 2009). In addition, subjects with disabilities had significantly poorer oral hygiene and the proportions of disabled subjects who had oral debris and calculus accumulation were significantly greater than subjects without disabilities. These results could be due to the difficulties caused by their disabilities interfering with adequate tooth brushing as previously reported in a study from Taiwan (Liu *et al*, 2010). Inadequate oral cleanliness could increase the risk for oral pathology such as gingivitis as seen by bleeding gums.

The present study revealed a significantly higher number of subjects with disabilities had gingivitis found in oral exams compared to subjects without disabilities, similar to the findings of previous studies (Anders and Davis, 2010; Purohit and Singh, 2012; Rajput *et al*, 2020). However, no significant difference in the proportions of subjects with and without disabilities was found in the proportions of subjects who reported having gum bleeding. This could be because 17% of our subjects with disabilities were blind and could not see if they had bleeding or not.

In our study, significantly more subjects with disabilities used fluoridated toothpaste than subjects without disabilities. This could be because subjects with disabilities attended boarding school and were provided fluoride toothpaste by their teachers, while the subjects without disabilities did not attend boarding school and had to rely on their caretakers to buy toothpaste for them.

The percentage of our study subjects with disabilities who used toothpaste with fluoride (47%) was higher than the percentage reported in a study from Hong Kong (20.6%) (Zhou *et al*, 2019). Our findings are in contrast to a previous study from southern India that reported finding no significant difference in the percentages of subjects with and without disabilities who used fluoride toothpaste (Purohit and Singh, 2012). Using toothpaste with fluoride can reduce the risk of getting dental caries (Marinho *et al*, 2003). Our results highlighted the benefits of using fluoride toothpaste and might explain the lack of a significant differences in the percentages of subjects with caries and untreated dental decay between subjects with and without disabilities.

The finding of this study revealed significantly fewer subjects with disabilities had a dental visit in the previous 12 months than subjects without disabilities, similar to the findings of a previous study (de Jongh *et al*, 2008). This suggested children with disabilities may have less access to dental care, lack of caregiver awareness or willingness to bring the subject to a dentist, communication problems, inadequate funds, disparities in the type of dental care given and/or the possible need to use general anesthesia to provide adequate dental care (Gaçe *et al*, 2014; Al-Maweri and Zimmer, 2015; Duddu *et al*, 2016; Suresan *et al*, 2017; da Rosa *et al*, 2020).

The present study only encompassed subjects in province 3 in Nepal, so it cannot be applied to other populations. Another limitation of this study was selection bias: subjects with disabilities were only recruited from schools, making it less representative of other children with disabilities.

In summary, subjects with disabilities had a significantly greater prevalence of gingivitis, poor oral hygiene, missing teeth and less frequent visits to a dentist. We found no significant difference in the prevalence of dental caries, decayed teeth and filled teeth between subjects with and without disability. The lack of a significant difference between those with and without disability for some of these factors may be due to significantly greater use of fluoride toothpaste by those with disabilities than those without disabilities. We conclude using fluoride toothpaste by disabled children is helpful and may reduce oral morbidity in this group. We also conclude there is a need to educate the caregivers of disabled children about the importance of good oral care at home.

Further studies are needed to better understand the extent of dental health problems among children with disabilities who do not attend boarding school and are needed to determine what methods are most effective in improving the disparity in oral health problems between those with and without disabilities in the study population.

ACKNOWLEDGEMENTS

We would like to express our heartfelt gratitude to Dr Anupama Bohara, Prof Shankar Raj Pathak and to the school teachers and the study subjects for their assistance with this study.

CONFLICT OF INTEREST DISCLOSURE

The authors declare no conflicts of interest.

REFERENCES

Acharya J, Chansatitporn N, Narkasawat K. Dental caries status and oral health needs among disabled children living in care centers in Kathmandu Valley, Nepal. *WebmedCentral Dentistry* 2014; 5: WMC004539.

Ameer N, Palaparthi R, Neerudu M, Palakuru S, Singam H, Durvasula S. Oral hygiene and periodontal status of teenagers with special needs in the district of Nalgonda, India. *J Indian Soc Periodontol* 2012; 16: 421-5.

Anders PL, Davis EL. Oral health of patients with intellectual disabilities: a systematic review. *Spec Care Dentist* 2010; 30: 110-7.

Ajami BA, Shabzendedar M, Rezay YA, Asgary M. Dental treatment needs of children with disabilities. *J Dent Res Dent Clin Dent Prospects* 2007; 1: 93-8.

Al-Maweri SA, Zimmer S. Oral health survey of 6-14-year-old children with disabilities attending special schools Yemen. *J Clin Pediatr Dent* 2015; 39: 272-6.

AlSadhan SA, Al-Jobair AM, Bafaqeeh M, Abusharifa H, Alagla M. Dental and medical health status and oral health knowledge among visually impaired and sighted female schoolchildren in Riyadh: a comparative study. *BMC Oral Health* 2017; 17: 154.

Carter HG, Barnes GP. The Gingival Bleeding Index. *J Periodontol* 1974; 45: 801-5.

da Rosa SV, Moysés SJ, Theis LC, *et al*. Barriers in access to dental services hindering the treatment of people with disabilities: a systematic review. *Int J Dent* 2020; 2020: 9074618.

de Jongh A, van Houtem C, van der Schoof M, Resida G, Broers D. Oral health status, treatment needs, and obstacles to dental care among noninstitutionalized children with severe mental disabilities in The Netherlands. *Spec Care Dentist* 2008; 28: 111-5.

Duddu M, Muppa R, Nallanchakrava S, Bhupatiraju P. Prevalence of dental caries in people attending special schools in Hyderabad-Secunderabad, India. *J Dr NTR Univ Health Sci* 2016; 5: 137-41.

Gaçe E, Kelmendi M, Fusha E. Oral health status of children with disability living in Albania. *Mater Sociomed* 2014; 26: 392-4.

Greene JC, Vermillion JR. The simplified oral hygiene index. *J Am Dent Assoc* 1964; 68: 7-13.

Liu HY, Chen CC, Hu WC, *et al*. The impact of dietary and tooth-brushing habits to dental caries of special school children with disability. *Res Dev Disabil* 2010: 31:1160-9.

Marinho VC, Higgins JP, Sheiham A, Logan S. Fluoride toothpastes for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev* 2003; 2003: CD002278.

Ningrum V, Bakar A, Shieh TM, Shih YH. The oral health inequities between special needs children and normal children in Asia: a systematic review and meta-analysis. *Healthcare (Basel)* 2021; 9: 410.

Nurliyanasari L, Wardani R, Susilawati S. The relationship between the dental health knowledge and oral hygiene index of the deaf. *Padjadjaran J Dent* 2009; 21: 123-6.

Prasad M, Patthi B, Singla A, Gupta R, Niraj LK, Ali I. Special care with special child-oral health status of differently abled children attending special schools in Delhi: a cross-sectional study. *J Indian Assoc Public Health Dent* 2018; 16: 137-43.

Purohit BM, Singh A. Oral health status of 12-year-old children with disabilities and controls in Southern India. *WHO South East Asia J Public Health* 2012; 1: 330-8.

Rajput S, Kumar A, Puranik MP, Sowmya KR. Oral health inequalities between differently abled and healthy school children in Bengaluru - a cross-sectional study. *Spec Care Dentist* 2020; 40: 55-61.

Sandeep V, Kumar M, Vinay C, Chandrasekhar R, Jyostna P. Oral health status and treatment needs of hearing impaired children attending a special school in Bhimavaram, India. *Indian J Dent Res* 2016; 27: 73-7.

Sharma A, Todkar M, Pandya H, Panwar M, Das M. Comparison of oral health status and dmft score of special children and normal children in burhanpur city. *Int J Appl Dent Sci* 2019; 5: 219-22.

Shivakumar KM, Patil S, Kadashetti V. Oral health status and dental treatment needs of sensory-impaired children of Satara District, India. *J Int Oral Health* 2017; 9: 197-201.

Suresan V, Das D, Jnaneswar A, Jha K, Kumar G, Subramaniam GB. Assessment of dental caries, oral hygiene status, traumatic dental injuries and provision of basic oral health care among visually impaired children of Eastern Odisha. *J Indian Soc Pedod Prev Dent* 2017; 35: 284-90.

Thapaliya MP. A report on disability in Nepal, 2016 [cited 2021 Jan 09]. Available from: URL: https://www.australianhimalayanfoundation.org.au/wp-content/uploads/2017/08/2016_Nepal_Disability_Report.pdf

Turkistani B, Elmarsafy SM. Caries experience among visually impaired and normal female students aged 6-18 years in Makkah, Saudi Arabia: a comparative study. *Int J Health Sci Res* 2019; 9: 286-92.

United Nations Children's Fund (UNICEF). The state of the world's children 2006, 2005 [cited 2021 Jan 09]. Available from: URL: https://www.unicef.org/media/84806/file/SOWC-2006.pdf

Ward LM, Cooper SA, Hughes-McCormack L, Macpherson L, Kinnear D. Oral health of adults with intellectual disabilities: a systematic review. *J Intellect Disabil Res* 2019; 63: 1359-78.

Wei H, Wang YL, Cong XN, Tang WQ, Wei PM. Survey and analysis of dental caries in students at a deaf-mute high school. *Res Dev Disabil* 2012; 33: 1279-86.

World Health Organization (WHO). Oral health surveys: basic methods, 4th ed, 1997 [cited 2020 Aug 12]. Available from: URL: https://apps.who.int/iris/bitstream/handle/10665/41905/9241544937.pdf?sequence=1&isAllowed=y

World Health Organization (WHO). World report on disability 2011, 2011 [cited 2021 Jan 09]. Available from: URL: https://apps.who.int/iris/handle/10665/44575

Yee R, Mishra P. Nepal National Oral Health 'Pathfinder' Survey, 2004 [cited 2021 Jan 08]. Available from URL: http://www.jnda.com.np/article/w80ers8vqs9.pdf

Zhou N, Wong HM, McGrath C. Oral health and associated factors among preschool children with special healthcare needs. *Oral Dis* 2019; 25: 1221-8.