

Oral health status of a group at a special needs centre in AlKharj, Saudi Arabia

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Abstract

People with special needs have been found to have high unmet oral health needs; especially periodontal treatment needs. Individuals may be more susceptible to dental caries and periodontal problems both at home or within residential centres. This descriptive cross-sectional study was undertaken to assess the dental caries and periodontal status along with the treatment needs at a special needs centre in AlKharj, Saudi Arabia. The overall sample size was 80 males between the ages of 16-50 years. The results clearly pointed to higher prevalence of oral related diseases (dental caries and periodontal disease) than reported in other studies for similar groups. The overall mean DMFT was 3.75, mean DMFS 9.45 and mean decayed teeth 2.47. This group may present with complex needs that can be met through prevention and which require extensive focus towards further research.

Key words: DMFT, DMFS, periodontal treatment complexity, special needs

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Introduction

People with special needs are those whose care is complicated by a physical, mental, or social disability (Davies et al., 2000; Ettinger et al., 2004). Increasing evidence suggests that people with disabilities experience poorer levels of health than the general population (Rimmer and Rowland, 2008). They have been described as having a narrower or thinner margin of health (DeJong et al., 2002). Evidence suggests that they experience poorer general and oral health. They also have higher unmet health needs and lower uptake of screening services (Elliott et al., 2003; Ouellette-Kuntz, 2005). People with special health needs have been found to have a high prevalence of dental caries and need for restorative care. The oral health condition of people with special needs may be influenced by age, severity of impairment and living conditions (Oredugba and Akindayomi, 2008). Individuals with special needs may exhibit limitations in oral hygiene performance due to their potential motor, sensory and intellectual disabilities. This group is prone to poorer oral health (Owens et al., 2006).

Earlier studies showed that groups of people with special needs had high unmet oral health needs; especially

periodontal treatment needs (Oredugba, 2006). Individuals may be more susceptible to dental caries and periodontal problems both at home or within residential centres; there is potential for unhealthy eating habits to be a contributory factor for dental caries (Oredugba and Akindayomi, 2008). Children from poorer families with special health needs as well as those with greater limitations attributable to disability were more likely to have unmet dental care needs (Lewis et al., 2005). Data to inform policies on disability should be sought widely and should be shared among a greater network of countries (Lang, 2009). As oral health care is one of the greatest unattended health needs among such individuals, this study was undertaken to assess the dental caries and periodontal status along with the treatment needs at a special needs centre in AlKharj, Saudi Arabia.

Materials and Methods

Study design and study population

A descriptive cross-sectional study was conducted at a special needs centre in AlKharj, Saudi Arabia in the month of July 2014. There are about five different types of special

needs centres in AlKharj. This study describes one such specific type of centre known as Comprehensive Rehabilitation Centre, AlKharj which houses adult patients above the age of 16 years with special needs.

The centre has a separate facility for males and females; however, only the male centre was chosen for inclusion in this study. The centre had a total of 163 males, the majority with physical and/or learning disability. The inhabitants in this centre included those who have a physical and/or learning disability that makes care at their respective homes unsuitable. The centre was an excellent housing facility with all up to date facilities including health, rehabilitation and recreational facilities. Apart from medical facilities, there was a physiotherapy centre and a dental unit inside the complex. The subjects were diagnosed mostly as having cerebral palsy with or without epilepsy, followed by learning disability.

Sampling

The male centre was chosen for this study owing to the cultural and ethical consideration of segregation of gender in Saudi Arabia. Initially, patients were randomly selected by a random numbers table according to their file numbers in the medical register.

Subsequently out of 163 people, a total of 80 subjects were enrolled in this study. Patients having a recent episode of epilepsy, patients needing feeding by naso-gastric tube and potentially uncooperative subjects were excluded from the study until the total number of 80 subjects was selected. This was carried out as a means of convenient sampling avoiding potential difficulties and risks of undertaking an oral survey in such complex patients. The assumption being that the excluded group would not be better in terms of oral health needs compared with those enrolled in the study. The exclusion criteria were followed on the guidance from the medical staff. It was advised to avoid putting those who had a recent episode of epilepsy under stress, as they may have another seizure during the dental examination. Potentially uncooperative patients included those who had severe learning disability and were self-harming. Some of these patients were having PEDI wraps (arm immobilisers) to prevent self-mutilation. Similarly, patients fed with a naso-gastric tube were difficult to examine and the caregivers could not adhere to the same oral hygiene regimen for these patients.

Ethical approval

The proposal of the project was presented to the Chair of the Research Ethics Committee, College of Dentistry at Salman bin Abdul-Aziz University, AlKharj, Saudi Arabia. It was proposed from the ethics committee that a formal permission was needed to be obtained from special needs centre hosting this group. A copy of proposal explaining in simple terms the aims and methods of the project was submitted to the centre. The individuals with capacity to understand such information were given participant information letters in the local language (Arabic), and these were distributed from the centre. For those subjects who lacked capacity for a valid consent, a consent letter written in Arabic language was distributed from the special needs

centre. The letter was directed at the parents/guardians of the subjects asking them to sign and return a letter of refusal, in case they were not willing for their ward to be the part of this programme. After fulfilling all these requirements and in accordance with International Guidelines (Dalton and McVilly, 2004), formal ethical approval was granted. An official permission was also obtained from the Director of Comprehensive Rehabilitation Centre AlKharj.

Training and calibration

Before the commencement of the study, the examiners were standardised and calibrated in the Department of Preventive Dentistry, College of Dentistry, Salman bin Abdulaziz University to ensure uniform interpretation, understanding, and application of the codes and criteria. Four examiners were selected on the basis of volunteering for the project. The examiners were labelled as Examiners A-D and all four underwent the training exercise for one week. Firstly, they were trained using radiographs and patient photos and then indices were recorded for selected and volunteering patients. Overall reliability of the examiners was assessed after two weeks. It was found to be 98.5% for dental caries and 91.3% for Basic Periodontal Examination. Furthermore, calibration was carried out at the third week to seek the intra-examiner and inter-examiner variability. Overall, Kappa scores of .95 were achieved for intra-examiner variability and .88 for inter-examiner variability.

Methodology

Caries diagnosis and periodontal examination was done by using World Health Organisation (WHO) Oral Health Surveys, Basic Methods- 2013 (Petersen *et al.*, 2013). Decayed Missing Filled Teeth (DMFT) index was used for caries prevalence and Decayed Missing Filled Surfaces (DMFS) index was used for caries severity. Basic Periodontal Examination (BPE) was carried out using a (WHO-BPE) probe. Subjects were grouped according to the periodontal treatment complexity (British Society of Periodontology guidelines, 2011; Periodontology, 2011). For ambulatory subjects, caries and periodontal examination was done within the dental unit of the facility using a mouth mirror, dry and moist air. Nevertheless, the preventive dentistry approach of '*score sound when in doubt*' was used. A tooth was considered 'cariou' only if there was a frank cavitation or obvious breakage of enamel. For non-ambulatory subjects, the caries diagnosis and periodontal examination was done at the bedside using a portable light source, a chip blower for dry air, a wooden tongue blade, a mouth mirror and a WHO-BPE probe. Retained teeth if any, were recorded along with the DMFT index.

Data recording

Each examiner was accompanied by a person who recorded DMFT, DMFS, BPE and retained teeth for each subject. Bedside recording required the help of the medical staff for cooperation of the subjects as well as ease of examination. All universal and standard precautions of infection control were considered and observed strictly. All diagnostic equipment except the light source was disposable.

Statistical analysis

The recorded data were compiled and entered in a computer using Statistical Package for Social Sciences (SPSS) version 20.0 software (Chicago, IL, USA). ANOVA and Chi-square tests were used for comparisons. A *p* value of less than 0.05 was considered as statistically significant.

Results

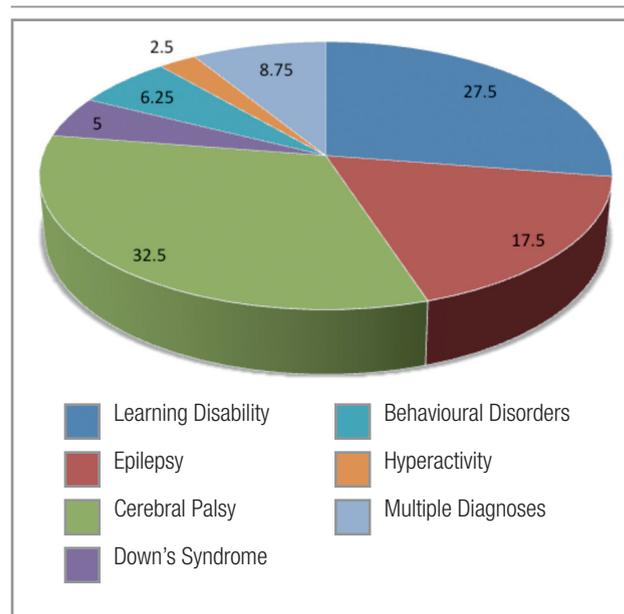
The overall sample size was 80 males between the ages of 16-50 years. Subjects were grouped according to the medical diagnosis present in their respective files. Each subject was identified and recorded according to his medical file number. *Figure 1* shows the percentage of the subjects as per their diagnosis in their medical files.

The overall mean DMFT was 3.75, mean DMFS 9.45 and mean decayed teeth 2.47. *Table 1* describes the mean DMFT, DMFS and Decayed teeth in each group according to the diagnosis in the medical files of the sample.

Table 2 describes the periodontal treatment complexity in each group which is the inference of the Basic Periodontal Examination (BPE). BPE was recorded for all subjects among the groups in the sample and then expressed in terms of periodontal treatment complexity. Underlying systemic medical condition increases the periodontal treatment complexity by 1 unit. (Periodontology, 2011).

Table 3 describes the presence of deciduous retained teeth among the subjects. About 25%, (20 out of 80 subjects) had at least one deciduous retained tooth.

Figure 1: Distribution of the sample.



Discussion

Although there is a code for disabilities in Saudi Arabia and much effort has been made for disability research as per the King Salman Center for Disability Research (www.kscdr.org.sa) limited research has been carried out on disabilities in Saudi Arabia (Al-Gain and Al-Abdulwahab, 2002). During the present study, the authors found only some studies relating oral health and disability in Saudi Arabia (Waldman *et al.* 2010; AL-Shehri 2012, Zakaria Murshid, 2014). People with special care needs often have poor oral health which worsens their struggle for social acceptance (Scully and Kumar, 2003).

Table 1: Mean DMFT/DMFS scores for respective medical diagnoses.

Diagnosis		DMFT	DMFS	Mean Decayed Score
Learning Disability N = 22	Mean	4.55	10.09	2.64
	Std. Deviation	2.841	9.086	2.150
Epilepsy N = 14	Mean	4.57	10.57	3.29
	Std. Deviation	3.131	7.521	3.268
Cerebral Palsy N = 26	Mean	1.69	4.38	1.08
	Std. Deviation	2.131	8.193	1.412
Down syndrome N = 4	Mean	2.00	14.00	.00
	Std. Deviation	2.309	6.928	.000
Behaviour Disorder N = 5	Mean	7.20	19.40	6.00
	Std. Deviation	4.087	15.159	4.583
Attention Deficit Hyperactivity disorder (ADHD) N = 2	Mean	10.00	22.00	7.00
	Std. Deviation	.720	.364	.035
Multiple Diagnosis (More than two of the above diagnoses) N = 7	Mean	4.00	10.71	3.14
	Std. Deviation	5.508	16.690	5.146
Total N = 80	Mean	3.75	9.45	2.47
	Std. Deviation	3.484	10.360	3.019
	ANOVA *sig	*.001	*.016	*.001

Test used: ANOVA. P<0.05 was considered statistically significant

Table 2: Diagnosis and Periodontal Treatment Complexity.

Diagnosis	Periodontal Treatment Complexity			Total (N)
	1	2	3	
Learning Disability	6	16	0	22
Epilepsy	2	12	0	14
Cerebral Palsy	14	10	2	26
Down syndrome	0	2	2	4
Behaviour Disorder	0	2	3	5
Hyperactivity	0	2	0	2
Multiple	4	0	3	7
Total	26	44	10	N = 80
(%)	(32.5)	(55)	(12.5)	
	Value		Asymp. Sig. (2-sided)	
Pearson Chi-Square	43.819		.000	

Table 3: Diagnosis and Retained teeth Cross-tabulation.

Diagnosis	Retained Teeth				Total (N)
	0	1	3	4	
Learning Disability	18	0	4	0	22
Epilepsy	12	2	0	0	14
Cerebral Palsy	22	4	0	0	26
Down syndrome	0	0	4	0	4
Behaviour Disorder	1	4	0	0	5
Hyperactivity	2	0	0	0	2
Multiple	5	0	1	1	7
Total	60	10	9	1	80
(%)	(75)	(12.5)	(11.25)	(1.25)	
	Value		Asymp. Sig. (2-sided)		
Pearson Chi-Square	61.06		.000		

In the present study, although the need for dental treatment was high, many of the individual subjects willingly presented themselves for examination in large numbers, indicating that the barriers of access may be higher for this group, in particular from the service provider's end. Barriers to dental treatment include fear, the need to be accompanied, difficult access to healthcare facilities, and often a negative attitude or lack of training of the professional (Fiske *et al.*, 2000; Emerson *et al.*, 2011).

A meta-analysis of caries among the Saudi population found mean dmft in primary teeth as 5.38 and mean DMFT in permanent teeth as 3.34. However, publication bias diagnostics has been suggested as possible overestimation of caries prevalence in permanent teeth but not in primary teeth (Khan *et al.*, 2013). In an age group of 11-12 year old girls with learning disability, mean dmft/DMFT was found to be 5.81 (Al-Qahtani and Wyne, 2004). Our study showed a mean DMFT 3.75 which is slightly higher than (3.34) of the Saudi population. There are varying results regarding caries

prevalence and severity among various study groups in Saudi Arabia (Al-Qahtani and Wyne, 2004). The conflicting results from the different studies could be attributed to different age groups, severity of impairments and type of residence of the population studied (Choi and Yang, 2003).

In the present study, higher numbers of decayed teeth were found among adults with special needs. In one previous national population survey, rates of caries among the disabled population were found to be higher in comparison to the general population for all age groups studied (Shyama *et al.*, 2001). Nevertheless, DMFT can be a good estimate of past caries experience but not the present treatment need, as it accounts for filled and missing teeth as well.

A total of 20 patients (25%) had at least one retained deciduous tooth. Higher numbers of retained teeth were found in those with multiple diagnoses, learning disability and Down syndrome. Whilst in the first two types of diagnoses there may be an indication of unmet need, the presence of retained teeth in case of Down syndrome may be

attributed to irregular eruption sequence and the prevalence of increased tooth agenesis in the primary as well as in the permanent dentition. The clinical relevance of early recognition of hypodontia is an adequate treatment plan for maintenance of primary teeth or early orthodontic intervention (Acerbi *et al.*, 2001). However, no caries was found in the Down syndrome group. This may be attributed to the small size of the group within the sample and also to the lesser prevalence of dental caries among Down's syndrome patients (Castilho and Marta, 2010).

In general, the oral hygiene of the subjects examined in this study was rather poor and higher complexity for periodontal treatment need was found for people with Down syndrome and behavioural disorders. Several other studies have also found poor results for periodontal health and oral cleanliness especially among children with disabilities (van Houtem *et al.* 2007; Tak *et al.*, 2012; Ameer *et al.*, 2012). These results may be due to low physical abilities, which could cause difficulties in tooth brushing. Oral health may be affected by the following: limited understanding on the importance of oral health management, difficulties in communicating oral health needs, anticonvulsant medications that impact upon gingival health and a fear of oral health procedures (Faulks and Hennequin, 2000; Lindemann *et al.*, 2001).

These results clearly point to higher prevalence of oral related diseases (dental caries and periodontal disease) as reported in other studies for similar groups (Oredugba, 2006; Oredugba and Akindayomi, 2008). Some diseases may have a predisposition to periodontal problems as in case of Down syndrome patients (Cichon, 2011). Others may experience significant barriers to access (Bonito, 2002; Lewis *et al.*, 2005). In one study about children with special needs, it was reported that a significantly higher proportion of children with disabilities did not receive any routine dental care in comparison to healthy children, because non-cooperation and communication problems were found to be important barriers leading to a relatively low degree of quality dental care (de Jongh *et al.*, 2008).

Many studies found that the treatment needs of this group have to be looked from a different perspective (Cumella *et al.* 2000; Lewis *et al.*, 2005). Indeed the treatment needs of this vulnerable population have to be looked at in a different context owing to the fact of predisposition to oral disease in

certain conditions, unhealthy life style practices and lesser utilisation of treatment services available (Elliott *et al.*, 2003; Elliot *et al.*, 2005).

Conclusion

Oral diseases were prevalent in the present sample of individuals with special needs at the Comprehensive Rehabilitation Centre in AlKharj, Saudi Arabia, with evidence of increased periodontal treatment need. The group with special needs presented with high caries prevalence and severity. There were a high number of untreated decayed teeth. The majority of individuals among the group presented with a higher periodontal treatment complexity. A quarter of the subjects presented with at least one retained deciduous tooth. There was a high unmet need for oral diseases in the study group.

Recommendations

The study was limited by the small number of subjects with physical and learning disabilities who were enrolled in the screening programme. Moreover, some subjects had to be excluded from the study to avoid potentially difficulties. These patients may present with more need for oral health care. A complete oral health survey for this group needs to be undertaken in order to establish a better view of their specific oral health treatment needs. This situation calls for immediate attention for an integrated approach to be taken in order to improve the oral health for these individuals. This group may present with complex needs that can be met through prevention and which require extensive focus towards further research (Clinical Guidelines and Integrated Care Pathways for the Oral Health Care of People with Learning Disabilities, 2012).

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References

- Acerbi, AG, De Freitas C, De Magalhaes MH. Prevalence of numeric anomalies in the permanent dentition of patients with Down syndrome. *Spec Care Dent* 2001; **21**: 75-78.
- Ahlborg B. Practical prevention. *Disability Oral Care* 2000; **29**: 39.
- AL-Gain SI, AL-Abdulwahab SS. Issues and obstacles in disability research in Saudi Arabia. *Asia Pacific Disability Rehabilitation J* 2002; **13**: 45-49.
- AL-Qahtani Z, Wyne AH. Caries experience and oral hygiene status of blind, deaf and mentally retarded female children in Riyadh, Saudi Arabia. *Odontostomatol Trop* 2004; **27**: 37-40.
- AL-Shehri SA. Access to dental care for persons with disabilities in Saudi Arabia (Caregivers' perspective). *J Disabil Oral Health* 2012; **13**: 51.
- Alsarheed M, Bedi R, Alkhatib MN, Hunt NP. Dentists' attitudes and practices toward provision of orthodontic treatment for children with visual and hearing impairments. *Spec Care Dent* 2006; **26**: 30-36.
- Alsarheed M, Bedi R, Hunt NP. Attitudes of dentists, working in Riyadh, toward people with a sensory impairment. *Spec Care Dent* 2001; **21**: 113-116.
- Ameer N, Palaparthi R, Neerudu M, Palakuru SK, Singam HR, Durvasula S. Oral hygiene and periodontal status of teenagers with special needs in the district of Nalgonda, India. *J Indian Soc Periodontol* 2012; **16**: 421-425.
- Bonito A. Executive summary: dental care considerations for vulnerable populations. *Special care in dentistry: official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry* 2002; **22**: 5S.
- Castilho AR, Marta SN. Evaluation of the incidence of dental caries in patients with Down syndrome after their insertion in a preventive program. *Cien Saude Colet* 2010; **15 Suppl 2**: 3249-3253.
- Choi NK, Yang KH. A study on the dental disease of the handicapped. *J Dent Child* 2003; **70**: 153-158.
- Cichon P. The long-term effect of a preventive programme on caries, periodontal disease and tooth mortality in individuals with Down syndrome. *J Disabil Oral Health* 2011; **12**: 68.
- Cumella S, Ransford N, Lyons J, Burnham H. Needs for oral care among people with intellectual disability not in contact with Community Dental Services. *J Intellectual Disabil Res* 2000; **44**: 45-52.
- Dalton AJ, Mcvilly KR. Ethics Guidelines for International, Multicenter Research Involving People with Intellectual Disabilities 1, 2, 3, 4. *J Policy Practice Intellectual Disabilities* 2004; **1**: 57-70.
- Davies R, Bedi R, Scully C. ABC of oral health: oral health care for patients with special needs. *Br Med J* 2000; **321**: 495.
- 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 Dent* 2008; **28**: 111-115.
- Dejong G, Palsbo SE, Beatty PW. 1. The organization and financing of health services for persons with disabilities. *Milbank Quart* 2002; **80**: 261-301.
- Dougall A, Fiske J. Access to special care dentistry, part 6. Special care dentistry services for young people. *Br Dent J* 2008; **205**: 235-249.
- Elliot I, Nunn J, Sadlier D. *Oral Health and Disability: the way forward*. National Disability Authority, Dublin, 2005.
- Elliott J, Hatton C, Emerson E. The health of people with learning disabilities in the UK: Evidence and implications for the NHS. *J Integrated Care* 2003; **11**: 9-17.
- Emerson E, Baines S, Allerton L, Welch V. *Health inequalities and people with learning disabilities in the UK*. Durham: Improving Health and Lives: Learning Disabilities Observatory, 2011.
- Ettinger RL, Chalmers J, Frenkel H. Dentistry for persons with special needs: how should it be recognized? *J Dent Educ* 2004; **68**: 803-806.
- Faulks D, Hennequin M. Evaluation of a long-term oral health program by carers of children and adults with intellectual disabilities. *Spec Care Dentist* 2000; **20**: 199-208.
- Fiske J, Griffiths J, Jamieson R, Manger D. Guidelines for oral health care for long-stay patients and residents. *Gerodontology* 2000; **17**: 55-64.
- Khan SQ, Khan NB, Arrejaie AS. Dental caries. A meta analysis on a Saudi population. *Saudi Med J* 2013; **34**: 744-749.
- Lang R. The United Nations Convention on the right and dignities for persons with disability: A panacea for ending disability discrimination? *ALTER-European Journal of Disability Research/Revue Européenne de Recherche sur le Handicap* 2009; **3**: 266-285.
- Lewis C, Robertson AS, Phelps S. Unmet dental care needs among children with special health care needs: implications for the medical home. *Pediatrics* 2005; **116**: e426-e431.
- Lindemann R, Zaszchel-Grob D, Opp S, Lewis MA, Lewis C. Oral health status of adults from a California regional center for developmental disabilities. *Spec Care Dentist* 2001; **21**: 9-14.
- Oredugba FA. Use of oral health care services and oral findings in children with special needs in Lagos, Nigeria. *Special Care in Dent* 2006; **26**: 59-65.
- Oredugba FA, Akindayomi Y. Oral health status and treatment needs of children and young adults attending a day centre for individuals with special health care needs. *BMC Oral Health* 2008; **8**: 30.
- Ouellette-Kuntz H. Understanding health disparities and inequities faced by individuals with intellectual disabilities. *J Applied Res Intellectual Disabilities* 2005; **18**: 113-121.
- Owens J, Dyer T, Mistry K. People with learning disabilities and specialist services. *Br Dent J* 2010; **208**: 203-205.
- Owens PL, Kerker BD, Zigler E, Horwitz SM. Vision and oral health needs of individuals with intellectual disability. *Mental Retardation Developmental Disabilities Res Rev* 2006; **12**: 28-40.
- Periodontology, BSP. The British Society of Periodontology. Referral policy and parameters of care, BSP guideline 2011.
- Petersen PE, Baez RJ. World Health Organisation (WHO). 2013. Oral Health Surveys: Basic Methods.
- Rimmer JH, Rowland JL. Health promotion for people with disabilities: Implications for empowering the person and promoting disability-friendly environments. *Am J Lifestyle Med* 2008.

- Scully C, Kumar N. Dentistry for those requiring special care. *Primary Dent Care* 2003; **10**: 17-22.
- Shyama M, Al-Mutawa SA, Morris RE, Sugathan T, Honkala E. Dental caries experience of disabled children and young adults in Kuwait. *Community Dent Health* 2001; **18**: 181-186.
- Tak M, Nagarajappa R, Sharda A, Asawa K, Tak A, Jalihal S. Comparative assessment of oral hygiene and periodontal status among children who have Poliomyelitis at Udaipur city, Rajasthan, India. *Med Oral Patol Oral Cir Bucal* 2012; **17**: e969-976.
- Van Houtem CM, De Jongh A, Broers DL, Van Der Schoof M, Resida GH. [Post-academic specialties 9. Dental care of disabled children living at home]. *Ned Tijdschr Tandheelkd* 2007; **114**: 129-133.
- Waldman H, Al-Nowaiser A, Hamed M, Perlman S. Dentistry for individuals with special needs in Saudi Arabia: a commentary. *J Disabil Oral Health* 2010; **11**: 57.
- Zakaria Murshid E. Parents' dental knowledge and oral hygiene habits in Saudi children with autism spectrum disorder. *Global J Med Res* 2014; **14**.

