

Oral health status of 12-year-old children with disabilities and controls in Southern India

Bharathi M Purohit^a, Abhinav Singh^b

Background: This study explores the association of disabilities and oral health. The aim of the study was to compare and assess oral health status of 12-year-old children with disabilities with healthy controls in Karnataka, Southern India.

Methods: A total of 191 schoolchildren with disabilities were examined from 12-year age group. For comparison, 203 healthy children were randomly selected from other government schools. Clinical data were collected on periodontal status, dental caries, treatment needs and dental malocclusion using WHO criteria. A chi-squared test was used to compare between categorical variables. Linear and logistic regression analysis was performed to determine the importance of the factors associated with caries status.

Results: Significant differences were noted in the frequency of sugar consumption between subjects with disabilities and their healthy controls. Subjects with disabilities had significantly higher CPI (community periodontal index) scores than their healthy counterparts ($p < 0.001$). Dental caries was present in 89.8% children from special schools as compared with 58.6% from the control group. Mean DMFT (decayed, missing, filled teeth) values for special school children and healthy controls were 2.52 ± 2.61 and 0.61 ± 1.12 , respectively. Higher prevalence of malocclusion was seen in subjects with special healthcare needs, with 66.4% having definite malocclusion and 17.4% of controls having malocclusion ($p < 0.001$). The mean values for treatment needs were higher in subjects with disabilities. Regression analysis showed that, type of school, male gender, low frequency of brushing, increased frequency of sugar consumption between meals and dental malocclusion were significantly related to dental caries.

Conclusion: Poor oral health of children with disabilities as compared with their healthy controls in terms of periodontal status, dentition status, treatment needs, and dentofacial anomalies was found in our study, which confirms a need for preventive treatment for these children.

Key words: Children with disabilities, oral health, malocclusion, dental caries.

Introduction

Around 10% of the world's population, or 650 million people, live with a disability. This figure is increasing through population growth, medical advances and the ageing process.

According to the UN Development Programme (UNDP),¹ around 80% of people with disabilities live in developing countries. According to the National Sample Survey Organization

^aAssistant Professor - Department of Public Health Dentistry, People's College of Dental Sciences & Research Centre, Bhopal - India

^bAssistant Professor - Department of Public Health Dentistry, ESIC Dental College & Hospital, Rohini - New Delhi

Under Central Ministry of Labour & Employment - Government of India

Correspondence to Bharathi M Purohit (email: bharathipurohit@yahoo.com)

(NSSO), there are 18.49 million persons with disabilities in India which constitutes around 1.8% of the total population.²

The Maternal and Child Health Bureau (MCHB) has defined children and adolescents with special healthcare needs (SHCN) as those "who have or are at increased risk for a chronic physical, developmental, behavioural, or emotional condition and who require health and related services of a type or amount beyond that required by children generally".^{3,4}

The term, special needs, is a short form of special education needs (SEN) and comes into play whenever a child's education programme is officially altered from what would normally be provided to students through an Individual Education or Programme Plan.⁴

Children with disabilities may be physically, mentally or socially challenged. In 1995, the Government of India under the "Persons with Disabilities Act" described "handicapped" as a person with one or more of the following disabilities: impaired vision, leprosy-cured, hearing impaired, locomotor disability, mental retardation and mental illness. It may be pointed out that a child who is physically or mentally handicapped also meets with social handicaps to the extent to which he/she is subject to social rejection or misunderstanding and cannot make use of the normal value of social fulfillments.⁵

Children with disabilities may have more marked oral pathologies either because of their actual disability or for other medical, economic, social reasons, self-mutilating behaviours (excessive tooth grinding), cariogenic effect of medicines with high sugar content or even because of their parents' have difficulty in carrying out proper regular oral hygiene measures.⁶ Although individuals who are disabled are entitled to the same standards of health and care as the general population,

these children and their families constantly experience barriers to the enjoyment of their basic human rights and to their inclusion in society, more because of the environment they live in rather than the result of impairment. The additional burden placed on families with children having disabilities, deepens the impact of economic poverty and may further perpetuate discriminatory attitudes towards these groups.^{6,7}

Although numerous studies have documented the oral health of children with special health-care needs, there is almost no data available for 12-year-olds. It is at this age that all permanent teeth except third molars will have erupted. Also, 12 years is a WHO recommended index age group for international comparison and monitoring trends of dental diseases. Lack of this important data is a serious limitation to oral health comparison of children with disabilities and healthy children. Hence, this study explores the association of disabilities and oral health. Specifically, the aim of the study was to compare and assess the oral health status of 12-year-old children with disabilities with same-aged healthy children in Karnataka, South India.

Material & Methods

Study design and subjects

The cross-sectional study was conducted among children with disabilities in Udupi district in Karnataka, Southern India. There are six schools for special children in Udupi district. The list of the schools along with the strength was obtained from the Women and Child Development Office, Udupi, Karnataka.

A total of 191 children in the 12-year age group were enrolled in special schools; all the children were selected and invited to participate in the study. A total of 203, 12-year-olds were selected randomly for comparison from four other government schools. All the children

attending the government schools were in the mainstream of education and were designated as healthy subjects.

The study design consisted of close-ended questions on sociodemographic factors, dietary habits, oral hygiene habits, type of disability (in case of children with special health-care needs) and visits to any health personnel for dental needs. Information was collected by means of personal interviews administered by the examiner. The intelligence quotient (IQ) of the children was recorded from the medical certificate obtained from the psychiatrist and assessed using Wechsler Intelligence Scale for Children' (WISC) test, developed by Dr David Wechsler, for children between the ages of 6 and 16. The dental team comprised the examiner assisted by a recording clerk, an interpreter and a local health worker.

Clinical examination

All the subjects were examined in premises of the respective schools, with tables and portable chairs under adequate illumination (Type III) and clinical data were collected on periodontal status, dental caries, treatment needs and dentofacial anomalies. A pilot study was conducted on 30 children each in comparable age groups to see the feasibility of the study and to deduce the sample size for the comparison group.

Community periodontal index (CPI) was used to record the periodontal condition using a mouth mirror and CPI probe. The CPI was introduced by WHO to provide country profiles of periodontal health status and to enable countries to plan intervention programmes to reduce the prevalence and severity of periodontal disease. It is a screening procedure for identifying actual and potential problems posed by periodontal disease.

WHO's criterion was used for detection of dentition status and treatment needs. This is

applied for assessing dental caries experience along with various treatment modalities both in permanent and primary dentition, using coding criteria. The criterion recommends examination for dental caries using mouth mirror and CPI probe. Radiography for detection of proximal caries is not recommended. The examination was conducted with a plain mouth mirror and CPI probe as given by WHO 1997. A systematic approach was adopted for assessment of dentition status and treatment needs. The examination proceeded in an orderly manner from one tooth or tooth space to the adjacent tooth or tooth space. Dentofacial anomalies were assessed using the Dental Aesthetic Index.⁸

Ethical clearance was taken from Kasturba Hospital Ethics Committee, Kasturba Hospital, Manipal, Karnataka. Informed written consent was taken from parents and children before carrying out the survey. The survey was scheduled between September 2008 and January 2009. All examinations were performed by a single examiner and duplicate examinations were conducted on one of every 10 subjects throughout the survey. Intra-examiner reliability for various indices was assessed using kappa statistic which was in the range of 0.90–0.92.

Statistical analysis

SPSS (statistical package for social sciences) software version 16 was used for statistical analysis. Mean and standard deviations were calculated for DMFT and their components. A chi-squared test was used to compare between categorical variables. A Mann-Whitney U-test was used for comparison between two groups for quantitative variables. Logistic and linear regression analysis was performed to determine the importance of the factors associated with caries status. A set of independent variables including type of school attended, gender, frequency of cleaning

teeth, frequency of between-meal sugar consumption, and utilization of dental care was considered. Odds ratio (OR) was calculated for all variables with 95% confidence intervals. All the dependent variables to be included in the regression analysis were dichotomized. $p \leq 0.05$ was considered as statistically significant.

Results

A total of 394 subjects comprised the sample: 191 children with special healthcare needs and 203 healthy controls. In both study groups, gender was almost equally distributed. A majority of the children with SHCN were mentally challenged, with 76 (39.6%) having moderate mental disability (IQ level of 35–49). Few children had both mental and physical disabilities, together significantly affecting oral health. In relation to literacy level, 40%

of the mothers of those in the group with SHCN and 38.6% of mothers in the control group had completed middle school and most were not employed (69.1% special and 72.5% control group); 46.6% of the fathers of those in the group with SHCN and 71.9% in the control group had completed high school and 52.8% and 63.6%, respectively, were skilled workers. In both the study groups, the majority of the subjects were above the poverty line (76% and 97% in special and healthy controls respectively).⁵ No statistically significant differences were noted between the two groups with respect to demographic variables.

Oral health behavioural characteristics of the study population are presented in Table 1. Statistically significant differences ($p < 0.001$) were seen in the frequency of sugar consumption between subjects with special

Table 1: Distribution of the study population according to oral health behavioural characteristics

Oral health-related behaviour variables		Children with special healthcare needs N (%)	Healthy controls N (%)	χ^2 (df)	p value
In-between meal sugar consumption on the previous day	Once a day	32 (16)	12 (5.8)	8.9 (2)	<0.001
	Two times a day	159 (84)	147 (72.6)		
	≥ 3 times a day	0	44 (21.6)		
Brushing frequency	Once daily	174 (91.3)	160 (78.8)	6.7 (1)	<0.05
	Two or more times/day	27 (8.3)	43 (21.2)		
Mode of cleaning teeth	Toothpaste	191 (100)	203 (100)	NA	
	Toothpowder	0	0		
Material used for cleaning teeth	Toothbrush	191 (99.6)	201 (99.1)	0.72 (1)	0.40
	Finger	1 (0.4)	2 (1.0)		
Dental visit	Never visited	160 (83.8)	179 (88.1)	1.21 (3)	0.27
	1–3 months ago	10 (5.3)	13 (6.5)		
	4–6 months ago	14 (7.5)	10 (4.8)		
	>6 months ago	7 (3.4)	1 (0.6)		
Brushing assistance	Assisted	46 (24.2)	0	12.1 (2)	<0.001
	Non-assisted	102 (53.6)	201 (99.0)		
	Under supervision	43 (22.3)	2 (1.0)		

$p \leq 0.05$ = significant, NA=not applicable

healthcare needs and their healthy controls. Brushing frequency in the majority of both groups was once a day, with toothbrush and toothpaste. A total of 160 subjects (83.8%) with special healthcare needs and 179 healthy counterparts (88.1%) reported having never visited a dentist, and there was no statistically significant difference between the groups. In relation to brushing assistance, 46 subjects (24.2%) with special healthcare needs needed help brushing, whereas none of the 203 healthy children needed assistance in brushing and there was a statistically significant difference ($p < 0.001$).

The mean number of sextants with a healthy periodontium, bleeding, and calculus was calculated. Subjects with special healthcare needs had significantly higher CPI scores than their healthy counterparts ($p < 0.001$). Dental caries was detected in 172 (89.8%) school children and 119 (58.6%) healthy children with disabilities and there was a significant difference between the groups ($p < 0.001$). The mean values of decayed teeth (DT), missing teeth (MT), and DMFT in subjects with special healthcare needs were found to be higher than for the healthy controls. The D component contributed most to the caries index. Mean DMFT values for children with disabilities and healthy controls were 2.52 ± 2.61 and 0.61 ± 1.12 , respectively. There was a significantly higher prevalence of malocclusion in subjects with special healthcare needs, with 66.4% having definite malocclusion, while 17.4% of control subjects had definite malocclusion ($p < 0.001$). The mean values for treatment needs were higher in subjects with special healthcare needs. They had a greater need for fissure sealants, pulp care as well as one- and two-surface restorations. (Table 2)

Table 3 depicts the stepwise multiple linear regression analysis of the caries status (DMFT) in relation to several independent variables, which included school attended, gender,

frequency of cleaning teeth, frequency of between-meal sugar consumption and dental malocclusion. The variables in the model explained 70% of the variance in caries status for the combined 12-year group. Schools for special children, male gender, low frequency of cleaning teeth, higher in-between-meal sugar consumption and dental malocclusion were significantly related to dental caries.

Logistic regression analysis was employed to determine the contribution of type of school attended, gender, oral hygiene practices, frequency of between-meal sugar consumption, dental visits and dental malocclusion to dental caries. The results of logistic regression showed that all independent variables were significantly related to dental caries. The association between special schools and dental caries was evident with an odds ratio of 2.02 times. Males were more likely to have dental caries, as compared with females with an odds ratio (OR) of 0.70. Subjects who cleaned their teeth once or more times a day were less likely to have dental caries than those who cleaned their teeth sometimes or never (OR = 0.82; $p < 0.001$). High frequency of between-meal sugar consumption was also related to dental caries (OR = 1.01; $p < 0.001$). Utilization of dental care was inversely related to dental caries (OR = 1.24; $p < 0.001$). Association was found between malocclusion with dental caries; specifically with severe and handicapping malocclusion (OR = 1.45, $p < 0.001$). (Table 4)

Discussion

Designing a system of care for specifically affected children with disabilities would require objective data about the actual dental health, such as would be obtained from oral examination. In this study, oral health status and treatment needs of 12-year-old children with disabilities were assessed and compared with a group of healthy control subjects who

Table 2: Periodontal disease, dental caries experience, DAI index and treatment needs among study subjects

Clinical variables	CPI score/ Caries experience / DAI scores/ and Treatment needs	Children with special healthcare needs	Healthy controls	p-value
Community Periodontal Index Score (CPI)(Mean sextants \pm SD)	0=Healthy	0.1 (0.4)	1.4 (0.9)	<0.001
	1=Bleeding	2.8 (0.9)	2.1 (1.4)	<0.001
	2=Calculus	3.6 (1.5)	2 (0.7)	<0.001
Dental cariesN (%)	DMFT > 0	172 (89.8)	119 (58.6))	<0.001
	DMFT = 0	19 (10.2)	84 (41.4)	
DMFT (decayed, missing, filled)(Mean \pm SD)	Decayed (DT)	2.29 (2.49)	0.44 (0.88)	<0.01
	Missing (MT)	0.13 (0.50)	0.01 (0.39)	<0.05
	Filled (FT)	0.10 (0.62)	0.13 (0.49)	0.51
	DMFT	2.52 (2.61)	0.61 (1.12)	<0.01
Dental Aesthetic Index score (DAI) N (%)	< 25 (No abnormality)	43 (22.3)	168 (82.6)	<0.001
	26 – 30 (definite malocclusion)	126 (66.4)	35 (17.4)	
	30 – 35 (severe malocclusion)	21 (10.9)	0	
	36 and above (handicapping malocclusion)	1 (0.4)	0	
Treatment needs (mean \pm SD)	Fissure sealant	0.2 (0.6)	0.1 (0.40)	<0.01
	One surface filling	1.1 (1.3)	0.5 (1.0)	<0.01
	Two or more surface filling	0.9 (1.2)	0.5 (0.8)	<0.05
	Pulp care and restoration	0.8 (1.2)	0.3 (0.7)	<0.01
	Extraction	0.7 (1.3)	0.3 (0.7)	0.32

$p \leq 0.05$ = significant

were matched by sociodemographic factors such as age, gender, geographical location, parental literacy, occupation, and family income.

As many as 84% of the children from special schools and 72.6% in the control group reported having consumed sugar twice between meals on the previous day; the difference was highly significant ($p < 0.001$). According to the National Oral Health Survey in India (2002-2003), for 12-year age groups, it was reported that only 24% to 30% of the respondents consumed sugar once on the previous day,

while 14–15% had consumed sugar two or more times.⁹ The increased frequency of sugar consumption has an influence on dental caries, with a frequent fall in oral pH leading to enhanced caries activity, provided other factors also contribute.

The majority of the children in both the study groups had never visited a dentist. This may be due to their socioeconomic backgrounds, including family income, parental education, and area of residence along with cost of dental care, which might have influenced dental service utilization. De

Table 3: Multiple linear regression model for dental caries

Model	R	R ²	Adjusted R ²	SE	R ² Change	p
1	0.63 ^a	0.40	0.40	3.94	0.40	0.001
2	0.66 ^b	0.44	0.44	3.95	0.04	0.05
3.	0.72 ^c	0.52	0.52	3.97	0.08	0.001
4.	0.77 ^d	0.59	0.59	3.94	0.07	0.001
5.	0.84 ^e	0.70	0.70	3.95	0.11	0.001

^a Predictors: school

^b Predictors: school, gender

^c Predictors: school, gender, frequency of cleaning teeth

^d Predictors: school, gender, frequency of cleaning teeth, frequency of between meal sugar consumption

^e Predictors: school, gender, frequency of cleaning teeth, frequency of between meal sugar consumption, malocclusion

Table 4: Logistic regression analysis for study population with dental caries as dependent variable (Absence of dental caries, Dt score 0 Vs presence of dental caries, Dt scores ≥1) and school, gender, frequency of cleaning teeth, frequency of between-meal sugar consumption as independent variables

Variables	B	SE B	p	OR (95%CI)
School	0.82	0.0027	0.001	2.02 (1.94, 2.10)
Gender	0.37	0.0021	0.05	0.70 (0.62, 0.78)
Frequency of cleaning teeth	0.62	0.003	0.001	0.82 (0.74, 0.90)
Frequency of between meal sugar consumption	0.65	0.0012	0.001	1.01 (0.93, 1.09)
Dental visit	0.71	0.0015	0.001	1.24 (1.16, 1.32)
Dental malocclusion	0.75	0.0026	0.001	1.45 (1.37, 1.53)

Jongh et al. reported that a significantly higher proportion of children with disabilities in their study did not receive any routine dental care in comparison to healthy controls (53.1% and 23.8%, respectively) because noncooperation and communication problems were important barriers leading to a relatively low degree of quality dental care.¹⁰

Mean CPI scores were significantly higher among children with special health-care needs compared with healthy controls ($p < 0.001$). This may be attributed to the frequency of brushing, improper tooth brushing techniques, and use of medications in children with special healthcare needs, despite a similar percentage of these children using toothbrush and

toothpaste compared with the control group. The findings of this study were similar to those of the National Oral Health Survey among 12-year-olds, where the mean number of sextants with CPI score of 0, 1, and 2 was 1.2, 2.4, and 2.3 respectively. Studies by various authors have also reported significantly greater prevalence of periodontal disease in children with special healthcare needs compared with healthy controls.^{10,11}

Caries prevalence was higher in children with special healthcare needs than in the healthy controls, which could be due to poor muscular coordination and muscle weakness interfering with routine daily oral hygiene. Also, frequent use of sugar-sweetened

snacks, less frequent brushing, and some sociodemographic factors may be important determinants of caries risk for children in both groups. Similar findings have been reported by other authors^{12,14} where the prevalence of dental caries ranged from 78.3% to 89.6% in different types of children with special healthcare needs. Studies by other authors^{15,16} have reported higher rates of DMFT than in this study, with values ranging from 3.5 to 12.51 in children with SHCN. Ivancic et al. reported the mean DMFT in disabled and healthy children to be 6.39 and 4.76, respectively.¹⁵ Other studies by Kamatchy reported a mean DMFT of 1.06, 0.8, 2.0, 1 ± 1.42 , respectively, in children with various forms of SHCN, which was lower than our study. The 2002–2003 National Oral Health Survey also reported a lower mean DMFT of 1.87 compared with our study.⁹

There was a significantly higher prevalence of malocclusion in subjects with special healthcare needs as compared with healthy controls. Similarly, other studies have reported normal or minor malocclusions in less than 42%, definite malocclusion in 17–24%, severe malocclusion in 9–23.6%, and very severe malocclusion in 32% of the children with special healthcare needs.^{17,18}

Treatment needs for pulp care was higher among children with special healthcare needs, which could be due to untreated caries. The mean values for treatment needs were higher in subjects with special healthcare needs.

Receipt of timely dental services is of particular importance to children with special health-care needs because of the higher prevalence of structural irregularities, infections, and disease among these children compared with those in the general population. People with disabilities need to be treated as equals and in this direction, the United Nations in 2007 passed a new law which states that people with disabilities have the same rights

as everyone else and are equal before the law. The Convention on the Rights of Persons with Disabilities, the first legally binding disability-specific human rights convention is aimed at promoting, protecting and ensuring the full and equal enjoyment of all human rights and fundamental freedoms by persons with disabilities. Data and information to inform national policies on disability should be sought in a wide range of places and it is vital that such information – including on good practices – be shared among a wider network of countries. This will help disseminate experiences from developing countries, which are often innovative and cost-effective.^{19,23}

Conclusion

Poor oral health of children with disabilities as compared with their healthy controls in terms higher calculus deposition, 30% more caries prevalence and a 60% higher malocclusion was found in our study. The study results highlighted poor oral health status of children with special healthcare needs in terms of higher calculus deposition, 30% more caries prevalence and a 60% higher prevalence in malocclusion. The study results confirm the association of disability with poor oral health among 12-year-old children.

The study results also confirm a need for preventive treatment for these children. Receipt of timely dental services is of particular importance to children with disabilities because of the higher prevalence of periodontal diseases, dental caries and structural irregularities among these children compared with those in the general population. Regular training on oral health is very important for children with special healthcare needs and for healthy children. There needs to be a provision of primary dental health care for all children. The dental team should plan on providing comprehensive school-based

programmes, including oral health education to help children develop skills, provide fluoride supplements and sealants, offer dietary and nutrition counselling to promote oral health.

References

1. United Nations. International convention on the rights of persons with disabilities. New York: United Nations. 2006. <http://www.un.org/disabilities/convention/facts.shtml>.
2. Government of India. Disabled persons in India. Report No. 485 (58/26/1). New Delhi: National Sample Survey Organisation, 2003.
3. McPherson M, Arango P, Fox H, Lauver C, McManus M, Newacheck PW, et al. A new definition of children with special health care needs. *Pediatrics*. 1998; 102:137-140.
4. United Nations Educational, Scientific and Cultural Organization. Strengthening education systems. <http://www.unesco.org/new/en/education/themes/strengthening-education-systems/> - accessed 21 August 2012.
5. Park K. *Park's textbook of preventive and social medicine*. 19th edn. Jabalpur: Banarasi Das Bhanot Publishers, 2007.
6. United Nations Children's Fund. *Children and disability in transition in CEE/CIS and Baltic States*. Florence, 2005.
7. Inclusion International. *Hear our voices: a global report: people with an intellectual disability and their families speak out on poverty and exclusion*. London, 2006.
8. World Health Organization. *Oral health surveys: basic methods*. 4th edn. Geneva: WHO, 1997.
9. Bail RK, Mathur VB, Talwar PP, Chanana HB. National oral health survey and fluoride mapping 2002-2003. New Delhi: Dental Council of India, 2004.
10. 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(3): 111-115.
11. Saravanan S, Anuradha KP, Bhaskar DJ. Prevalence of dental caries and treatment needs among school going children of Pondicherry, India. *J Indian Soc Pedod Prev Dent*. 2003; 21:1-12.
12. Reddy K, Sharma A. Prevalence of oral health status in visually impaired children. *J Indian Soc Pedod Prev Dent*. 2011 Jan-Mar; 29(1):25-27.
13. Nahar SG, Hossain MA, Howlader MB, Ahmed A. Oral health status of disabled children. *Bangladesh Med Res Counc Bull*. 2010 Aug; 36(2):61-63.
14. 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.
15. Ivancić Jokić N, Majstorović M, Bakarčić D, Katalinić A, Szirovicza L. Dental caries in disabled children. *Coll Antropol*. 2007; 31:321-324.
16. Kamatchy KR, Joseph J, Krishnan CG. Dental caries prevalence and experience among the group of institutionalized hearing impaired individuals in Pondicherry—a descriptive study. *Indian J Dent Res*. 2003; 14:29-32.
17. Onyeaso CO. Comparison of malocclusions and orthodontic treatment needs of handicapped and normal children in Ibadan using the Dental Aesthetic Index (DAI). *Niger Postgrad Med J*. 2004; 11: 40-44.
18. Dinesh RB, Arnitha HM, Munshi AK. Malocclusion and orthodontic treatment need of handicapped individuals in South Canara, India. *Int Dent J*. 2003; 53: 13-18.
19. Harvard Project on Disability. *We have human rights: a human rights handbook for people with disabilities*. Cambridge. <http://www.hpod.org/pdf/we-have-humna-rights.pdf>
20. United Nations Economic and Social Commission for Asia and the Pacific. Disability at glance 2010: a profile of 36 countries and areas in Asia and the Pacific. Bangkok, <http://www.unescap.org/sdd/publications/disability/disability-at-a-glance-2010.pdf> - accessed 21 Aug 2012.
21. World Health Organization. *World report on disability 2011*. Geneva: WHO, 2011.
22. United Nations. *Keeping the promise: realizing the Millennium Development Goals for persons with disabilities towards 2015 and beyond: report of the Secretary-General (A/65/173, 26 July 2010)*. New York: UN, 2010.
23. United Nations. *Global issues on the UN agenda: persons with disabilities*. New York. <http://www.un.org/en/globalissues/disabilities> - accessed 21 Aug 2012.