

Oral health in 12- to 17-year-old athletes participating in the German Special Olympics

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Background. There is a lack of actual data regarding oral health in children and adolescents with intellectual disabilities.

Aim. To evaluate the oral health in adolescents with intellectual disabilities participating in the German Special Olympics games 2008.

Methods. A free voluntary dental examination was offered to the participating athletes. Dental examinations were performed according to WHO criteria by dental clinicians. In addition, information about the athletes' oral hygiene habits was collected.

Results. The number of adolescent athletes aged between 12 and 17 years who had their teeth

examined was 160. On average they were 15.3 years old. Caries prevalence was 58.1% and the mean DMFT was 2.3. The mean number of fissure sealed teeth was 2.5. About half of the participants showed signs of gum inflammation. The proportion of the adolescents living at home with their parents was 88%. More than 90% of them brushed their teeth by themselves without assistance.

Conclusions. Adolescents with intellectual disabilities seem to have benefited from various caries preventive measures which had been introduced during the last two decades in Germany but still have a poorer oral health than the general population. More specific prevention programmes seeking close cooperation with parents, custodians, and caretakers should be developed.

Introduction

To date, reliable information concerning the oral health of children and adolescents with intellectual disabilities is lacking not only in Germany but also worldwide. The few surveys performed in this field showed that these persons usually have a poorer oral hygiene, a higher caries experience and more periodontal diseases than the general population. This is true for children and adolescents^{1–6} as well as for adults^{7–9}. Many of these persons have coordination problems or physical handicaps and thus can perform an adequate oral hygiene but with difficulties^{4,5}. In general, dental treatment in these persons requires more time and more frequent visits than in the general population. Sometimes dental treatment can only be performed with the aid of general anaesthesia. Furthermore, a lot of practicing dentists have

insufficient experience in treating this particular patient group. Thus, they tend to avoid treatment of these patients^{6,10,11}. Studies reporting on oral health of German children and adolescents with physical and/or mental disabilities have not been published in recent years. This is remarkable even more in view of the fact that during the last two decades a lot of preventive measures (i.e., tooth brushing programs in kindergartens and schools, application of fluoride varnish or gel in schools and dental offices, application of fissure sealants and salt fluoridation) were introduced for all children and adolescents in Germany¹².

The sport events organised by Special Olympics (SO) in more than 150 countries of the world offer a good opportunity to collect health data of persons with mental disabilities. The organisation Special Olympics was founded in 1968 by Eunice Kennedy-Shriver in the USA and represents the biggest sports organisation for people with mental disabilities. The German branch of Special Olympics started to work in 1991 and organises summer games and winter games biannually.

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Within these sport events the program "Healthy Athletes" is offered regularly allowing the athletes to have examined eyes, ears, feet, and teeth on a voluntary basis without having to pay for. The dental part of this health promotion program is called "Special Smiles" comprising not only a dental examination but also provision of information about oral hygiene and balanced diet. Recently, in countries like Italy, United Kingdom, and United States of America the national Special Olympics games were used to collect oral health data¹³⁻¹⁸.

The main aim of this study was to determine the caries prevalence in German adolescent athletes with mental disabilities who took part in the German Special Olympics summer games 2008. Further aims were to calculate the caries experience of the teeth and to receive information about oral hygiene and caries preventive measures.

Methods

Sample

In 2008, the German Special Olympics Summer Games with 3581 participating athletes took place in Karlsruhe. Out of these athletes, 632 decided to have a free dental examination on a voluntary basis, the consent of the custodian included. For this study, only adolescents aged between 12 and 17 years were taken into account. Data of the few children less than 12 years old and the few adolescents coming from outside of Germany as well as the adults were not included. Thus in total, the records of 160 persons were available for the present evaluation.

Data collection

The examinations were performed by dental clinicians who had previously been trained by a dentist with large experience in epidemiology (A.S.). For the dental examinations, which took place in dental chairs, plane mirrors, blunt dental probes and artificial light were used. The WHO criteria were followed for collecting and recording the data. No radiographs were taken. Carious, missing and

filled permanent teeth and those presenting a fissure sealant were recorded. Only teeth with dentine caries lesions were taken into account. Missing and filled teeth were only considered when this was due to dental caries. Absent premolars on both sides without interproximal gaps were not considered as missing teeth for the DMFT score, because they had very probably been extracted for orthodontic reasons and not because of decay. Furthermore, absent lateral incisors in the upper jaw or second premolars in the lower jaw (with presence of the neighbouring teeth) were not regarded as missing teeth for the DMFT score, because they are frequently missing in persons with mental disabilities due to congenital reasons. Plaque and gum inflammation signs were noted after visual inspection on a yes/no basis to avoid pain or gingival bleeding of the participants.

The athletes were interviewed with regard to age, residential condition (living with their parents or in an institution), toothbrushing (alone or supported by another person), type of toothbrush (manual or electric), supportive oral hygiene means (dental floss or interproximal brushes), and fluorides (use of fluoridated gel or fluoridated mouthrinse).

Statistical analysis

Means and SD of the DT, MT, FT, and DMFT values were calculated to show the severity of caries experience. Persons with DMFT = 0 were regarded as caries-free and thus excluded for calculation of caries prevalence. 95% confidence interval (CI) of caries prevalence was also determined. The mean number of the molars and premolars with fissure sealants and the proportion of individuals without any fissure sealants were also calculated. In addition, the proportions of individuals with signs of gingivitis and those having visible plaque were determined.

P-values used for comparisons of two groups were obtained from the Mann-Whitney *U*-test. For comparison of proportions the chi-square test was applied. Differences were considered to be significant for *P* < 0.05. The software Epi Info (Centers for Disease Control and Prevention, Atlanta) was used for the statistics.

Table 1. Caries prevalence and mean DT, MT, FT, DMFT values as well as SiC-Index in male and female adolescent athletes with mental disabilities.

	Total	Males	Females
Mean age (SD) in years	15.3 (1.6)	15.2 (1.6)	15.5 (1.5)
Athletes (<i>n</i>)	160	102	58
Caries prevalence and CI in %	58.1 (50.1–65.9)	56.9 (46.7–66.6)	62.5 (48.5–75.1)
DMFT (SD)	2.31 (3.04)	2.07 (2.59)	2.84 (3.71)
DT (SD)	0.72 (1.51)	0.66 (1.48)	0.86 (1.59)
MT (SD)	0.19 (0.76)	0.14 (0.55)	0.29 (1.06)
FT (SD)	1.41 (2.30)	1.27 (2.09)	1.70 (2.65)
SiC-Index	5.79	5.18	7.10

SD, standard deviation; CI, 95% confidence interval.

Results

The mean age of the 160 athletes included in this study was 15.3 years (SD 1.6). The proportion of males was nearly twice as high as that of females (Table 1). The vast majority of the participants ($n = 147$) had exclusively intellectual disabilities whereas combined mental and physical disabilities were observed in 13 adolescents. Most of these athletes (88%) were living at home with their parents, and only a small proportion (12%) was being cared for in an institution.

Caries prevalence (DMFT > 0) among the athletes was 58.1% (95% CI 50.1–65.9%). The mean DMFT score was 2.31 (SD 3.04) and DMFT values ranged between 0 and 14. Between boys and girls DMFT values (Table 1) did not differ significantly ($P = 0.34$). About two-third of the teeth with caries experience had been restored. Untreated decayed teeth were seen in 30.0% of the participants whereas 41.2% of the adolescents had at least one restored tooth. In 9.4% of the athletes at least one tooth had been extracted. With rising age the proportion of adolescents with caries experience (DMFT > 0) as well as their mean DMFT values were increasing (Table 2).

Table 2. Caries prevalence and mean DT, MT, FT and DMFT values in the different age groups.

Age (in years)	12–13	14–15	16–17
<i>n</i>	31	45	84
Caries prevalence in %	45.2	46.7	69.0
DMFT (SD)	1.42 (2.11)	1.58 (2.65)	3.04 (3.35)
DT (SD)	0.42 (0.85)	0.62 (1.28)	0.88 (1.78)
MT (SD)	0.10 (0.54)	0.16 (0.52)	0.24 (0.93)
FT (SD)	0.90 (1.64)	0.80 (1.83)	1.92 (2.61)

The participants who were living at home had a mean age of 15.3 years and a mean DMFT value of 2.37 (SD = 3.03). The respective values for participants who were being cared for in an institution were 15.0 and 2.26 (SD = 3.36). With regard to these values no statistically significant differences were observed ($P = 0.67$ and 0.78). Caries prevalence was 59.4% and 57.9% respectively in both groups. In adolescents living with their parents a higher proportion of individuals with untreated carious defects (DT > 0) was found (31.9%) than in adolescents being cared for in an institution (21.1%).

On average 2.46 molars and premolars of the athletes were fissure sealed (Table 3). In 47.5% of these adolescents at least one fissure sealed tooth was observed. Those having at least one fissure sealant had statistically significant lower DMFT values than those without fissure sealants. The mean DMFT were 1.72 and 2.85 respectively and this difference was statistically significant ($P = 0.016$). Girls had a slightly higher mean number of teeth with fissure sealant than boys; the difference was however not significant: $P = 0.49$.

Tooth brushing was mainly performed without support. Only 7.6% of the athletes reported that they brushed their teeth with the aid of another person. A hand toothbrush was used exclusively by 73.7% of the participants, 17.5% performed tooth cleaning only with an electric toothbrush and the rest used both types of toothbrushes. A small proportion of the athletes used dental floss (10.0%) or interproximal brushes (6.2%). Similar small proportions of participants applied a gel with high fluoride concentration (14.3%) or utilized a fluoridated mouthrinse (8.7%).

Table 3. Mean number of fissure sealed teeth and proportion of athletes with at least one fissure sealed tooth (FS) in different age groups.

	All	Girls	Boys	12- and 13-year olds	14- and 15-year olds	16- and 17-year olds
<i>n</i> athletes with FV	76	28	47	17	22	37
Mean number of teeth with FS	2.46 (3.41)	2.33 (3.40)	2.73 (3.50)	2.35 (3.11)	2.73 (3.11)	2.36 (3.45)
Proportion of athletes with at least one FS in %	47.5	46.1	50.0	54.8	48.9	44.0

Table 4. Type of toothbrush and oral health.

Toothbrush	Hand toothbrush	Electric toothbrush	Both
<i>n</i>	118	28	14
Mean age (SD)	15.4 (1.5)	15.0 (1.5)	14.9 (1.8)
DMFT = 0 in %	43.2	39.3	35.7
Mean DMFT (SD)	2.08 (2.83)	3.25 (3.81)	2.36 (2.90)
Gingivitis (%)	44.1	60.7	42.9
Plaque (%)	61.9	60.7	50.0

Athletes who were assisted in tooth brushing (mean age 15.0 years) had a lower mean DMFT score than those who were brushing their teeth alone (mean age 15.3 years) with values of 1.08 and 2.45 respectively, but this difference was statistically not significant ($P = 0.09$). In the first group caries prevalence was much lower than in the second group (33.3% and 61.0% respectively) but this difference was statistically not significant ($P = 0.39$).

Adolescents who used a hand toothbrush had a distinctly lower mean DMFT value than those using an electric toothbrush (Table 4). This difference was not statistically significant ($P = 0.19$).

In athletes who regularly used a gel with high fluoride concentration a lower mean DMFT value was observed compared to those not using it (Table 5) but this difference was not statistically significant ($P = 0.31$). No

difference was found with respect to the use of fluoridated mouthrinse.

Signs of gum inflammation were observed in 46.9% of the athletes. Visible plaque was identified in 60.6% of the participants.

Discussion

It is very important to take into account that data concerning oral health which were collected in this investigation are not necessarily representative for all children and adolescents with mental disabilities. In this study the adolescents were able to participate in a sport event and to get examined which means that most of them had mild or moderate disabilities. An Italian study reported that oral health in persons who participated in Special Olympics Games was better than in persons with mental disabilities who were cared for in institutions¹⁸. Two other studies which were performed in children with disabilities demonstrated that oral health is inversely correlated to the degree of disability^{5,19}. Thus, it is very probable that the mean DMFT score of all German adolescents with mental disability is higher than in this study.

One has also to keep in mind that many adolescents with mental disabilities, especially those suffering from Down's syndrome, also suffer from severe periodontitis and loose some teeth due to this disease^{1,2,5,7}.

Table 5. Oral health and fluoride.

	Use of fluoridated gel		Use of fluoridated mouthrinse	
	Yes	No	Yes	No
<i>n</i>	23	137	14	146
Mean age (SD)	14.7 (1.6)	15.4 (1.5)	14.5 (1.7)	15.4 (1.5)
Caries prevalence in %	52.2	60.1	71.4	54.8
Mean DMFT (SD)	1.57 (2.11)	2.44 (3.15)	2.93 (3.34)	2.25 (3.01)

As permission to take radiographs in field examinations is usually rejected, some approximal surfaces with decay cannot be detected. When evaluating our results, it has to be taken into account that the DMFT-Index of the athletes would be higher if radiographs could have been taken.

In Germany caries prevalence and caries experience in children and adolescents has significantly decreased in the last two decades. In 1987, the mean DMFT score in 12-year-olds was 4.3 and has decreased since then to 1.0 in 2004²⁰. Main reasons for this seem to be the introduction of preventive programmes to be performed by community dentists as well as by private practitioners in children and adolescents. Part of these preventive programs which started in 1989 was reimbursement for private practitioners for applying fissure sealants. Furthermore, fluoridated salt has widely been accepted by German households since it became available in Germany in 1991¹².

Unfortunately, high quality studies about caries prevalence in children and adolescents with mental disabilities have not been performed in Germany during the last two decades. Pieper *et al.* observed in the 1980ies a mean DMFS score of 16.6 in 10–13-year-olds which corresponds to a DMFT score of approximately 5¹. Compared to this, the present mean caries experience in children with mental disabilities is much lower. In addition, since then dental care for this special group has been improved as is indicated by a shift of the components of the DMFT index. Compared to the adolescents who had been examined in the 1980ies, in the adolescents of the present investigation the share of extracted teeth diminished by about 50% and the share of filled teeth nearly doubled. The high SiC index in this survey reveals that a part of these adolescents still has a high caries experience.

Data of the present investigation on the prevalence of fissure sealants show that 47.5% of the adolescent athletes had at least one fissure sealed tooth and on average they had 2.5 fissure sealed teeth. In Berlin 15-year-old adolescents without disabilities were found to have on average 3.4 fissure sealed teeth²¹. On the one hand this shows

that the preventive measures available since 1989 had also a positive impact for children with mental disabilities, but on the other hand these children are still in need of improved and intensified preventive care.

Adolescents of the present investigation had DMFT values which were between 30% and 100% higher than in the corresponding German age groups without disabilities^{19–21}. Fortunately, this difference was not observed with respect to the care index. This means that in general children and adolescents who are able to participate in Special Olympics games receive a reasonable dental treatment in Germany. Nevertheless, the adolescent athletes had a fivefold higher number of extracted teeth than adolescents from the general population. Multiple reasons are responsible for this. Compared to their mates of the general population, children and adolescents with mental disability consult a dentist less regularly, are often more anxious and are less able to cooperate during dental treatment. Dentists need to have special knowledge about treatment of patients with mental disability. Furthermore, many dentists fail to set the indication for treatment in general anaesthesia early enough in order to perform secondary prevention.

Differences in the caries experience between adults with disabilities living with their families and those living in a care institution were found in a few studies⁹. In the present investigation such a disparity was not observed. One reason may be that it is easier in institutions to take care of children and adolescents than of adults.

The results of the present investigation cannot be compared quantitatively but qualitatively with other studies on oral health of athletes taking part in Special Olympics Games in other countries. In these studies the results had been calculated for all athletes together and no age classification had been applied. The present survey is the first classifying athletes according to age. Nevertheless, in these previous studies the athletes had also more teeth with untreated carious defects, more teeth had been extracted and less teeth had been restored than in the general population without disabilities^{13–18}.

In this study, fissure sealants seem to have contributed to caries prevention. This is in accordance with observations which had been made world wide in children without disabilities²². In this context it is very interesting to see that already in the year 1981 a Canadian study was published where fissure sealant had been successfully applied in molars of the primary and the permanent dentition of mentally retarded children²³. Thus the molars of children with mental disability should be sealed as early as possible. This preventive measure should also be applied when dental treatment is for whatever reason performed in general anaesthesia.

The high prevalence of gum inflammation signs observed in the participants of our study (about 47%), is probably mainly due to insufficient oral hygiene. Nearly the same proportion of persons with gingival inflammation signs was found in athletes attending the Special Olympics Games in Puerto Rico and in the United Kingdom^{16,17}.

To improve oral health in children and adolescents with mental disability, it is very important to work closely with their families as well as with centres and community groups that are advocate for the care of these children with special needs. Preventive programmes should start at a very early age. Apart from oral health education and dietary control, the use of special preventive tools like three-head toothbrushes, electric toothbrushes, interproximal brushes and mouth-rinses should be promoted^{2,9,24-26}. As our investigation shows, such oral hygiene tools are already used by a very small number of adolescents with disabilities. Thus, family members and caretakers should be encouraged and trained to give support during these procedures. Furthermore, fluoridated gels should be used at home regularly. Concerning the institutions for children with disabilities, fluoride varnish should be regularly applied and fluoridated salt should be always used. Also caretakers in such institutions should be trained in this field or dental nurses should be engaged.

All these measures have proved to contribute significantly to caries prevention not only in children without mental disabilities but

also in children with mental disabilities²⁵⁻²⁷. In adults with mental disabilities a special programme that includes follow up instructions in the institutions these persons were living showed promising results regarding oral health^{28,29}. Furthermore, a specific oral hygiene programme for children with autism was developed²⁹. These programmes could easily be adapted for children with intellectual disabilities.

Finally, concern should also target the education of dental students. A lack of basic knowledge regarding the dental care and treatment of patients with disabilities was observed in dental school graduates^{10,11}. Thus, undergraduate students should receive information and gain clinical experience regarding the treatment of people with disabilities in a way that these future dentists feel more comfortable when they will have to treat such patients. In addition, postgraduate training programs in special care dentistry like those that have been recently initiated by some universities outside of Germany³⁰ should also be established in Germany.

What this paper adds

- It gives relevant information on the oral health and the oral hygiene of adolescents with intellectual disabilities in Germany.
- This paper shows that adolescents with intellectual disabilities have benefitted from various preventive measures but still have a poorer oral health compared to adolescents without disabilities.

Why this paper is important to paediatric dentists

- Paediatric dentists do have a lot of patients with disabilities. Data concerning their oral health and oral hygiene could encourage them to start different prevention measures as early as possible.
- The higher rates of caries prevalence demand a focus on individual prevention interventions and on oral hygiene for such patients.

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