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# Oral health needs of athletes with intellectual disability in Southern Europe: Greece, Italy and Spain

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## Abstract

**Aims:** The population with intellectual disabilities (ID) has been reported to be a vulnerable population in terms of oral health. The aims of this study were to evaluate the oral condition and treatment needs of Special Olympics (SO) athletes from Greece, Italy and Spain.

**Methods and results:** A cross-sectional study was performed with data collected in annual SO events held in Greece, Italy and Spain, between 2010 and 2012. The recorded parameters were the presence/absence of edentulism, untreated decay, filled or missing teeth, sealants, tooth injury and signs of gingival disease. Among the main findings, the prevalence of untreated decay was 57.0% in Greece, 48.8% in Italy and 41.7% of the Spanish athletes. The prevalence of signs of gingival disease was 61.1% in Greece, 60.6% in Italy and 66.1% in Spain. While the majority of the athletes were in need of dental treatment.

**Conclusions:** Oral disease is an unresolved problem among athletes with ID in these Mediterranean countries. Therefore efforts should be directed to meet their treatment needs and to prevent oral disease.

## KEYWORDS

dental treatment, intellectual disability, oral health

## 1 | INTRODUCTION

According to the World Health Organization, there are approximately 600 million of individuals with disabilities.

Within the context of health care, the Convention on the Rights of People with Disabilities states that people with disabilities are entitled to receive care of the same quality and standard without discrimination, as the rest of the population.<sup>1</sup>

The health care systems in Southern Europe offer limited amount of fully or partially-funded dental treatments

for children with ID,<sup>2,3</sup> even though it has been shown that they are more vulnerable to oral health problems.

Firstly, several factors have been identified for their potential to jeopardize the oral health of these individuals, that is features related to their disability as poor reflexes, motor impairments, high palate, maxillary hypoplasia, malocclusions, open bites and abnormalities in tooth morphology or eruptive pattern, among others.<sup>4</sup>

Secondly, individuals with ID have been reported to have poorer oral hygiene, higher plaque levels, more severe gingivitis and periodontitis than population without ID.

Moreover, individuals with Down syndrome have higher risk of gingivitis, related to specific sub-gingival bacterial species and impaired immunologic responses.<sup>5-7</sup>

The prevalence of dental caries, however, is a controversial topic as lower or similar values have been published in comparison to general population.<sup>8-10</sup> The last systematic review on the topic revealed that in most quantitative analyses, children and adolescents with ID present fewer decayed and filled permanent teeth, while qualitative studies show that children with ID might have higher Decayed/Missing/Filled Surface (DMFS) scores.<sup>7</sup>

In spite of the evidence, governments have failed on providing adequate, accessible and affordable services for individuals with disabilities.<sup>11</sup> Acknowledging this problem, the program 'Special Olympics Special Smiles' (SOSS) focuses on standardized and region-specific data collection destined to improve access to dental care for people with special needs.<sup>12</sup> By means of data from SOSS, the aim of this study was to evaluate the oral condition and treatment needs of athletes with ID from Greece, Italy and Spain.

## 2 | METHODS

Oral health data were collected through interviews and oral examinations of athletes participating in annual SO events held in Greece, Italy and Spain, between 2010 and 2012. The athletes had their teeth examined on a voluntary basis, while consent from the athlete's parent or guardian was obtained prior to the event. The Joint Ethical Committee of the Ghent University Hospital approved this study as 2013/816.

The collected data consisted of demographic data (age, gender and date of birth), oral health screening and education in oral hygiene techniques. Standardized data collection forms were used to record the presence of edentulism, untreated decay, filled or missing teeth, sealants, tooth injury and signs of gingival disease.

The screeners were dentists recruited from university dental schools and dental professional organizations that were previously trained according to the Training Manual for Standardized Oral Health Screening.<sup>12</sup>

The standardized examination protocol, developed for SOSS by the US Centres for Disease Control and Prevention, Division of Oral Health, was strictly followed. This protocol involves the assessment of the oral cavity to determine the presence or absence of several conditions in separate cycles, independent of others. Third molars or partially erupted teeth were not included in this assessment.<sup>12</sup>

### 2.1 | Brushing habits

The athlete was asked how often does he/she clean his/her mouth?

### 2.2 | Oral pain

The presence of oral pain was self-reported by the athletes. The location of pain was also recorded.

### 2.3 | Edentulism

Recorded in case of complete absence of teeth or root remnants.

### 2.4 | Untreated decay

Presence of untreated decay was recorded in both the primary and permanent dentitions when at least one area of cavitation that would accommodate a 0.5 mm-diameter (or larger) bur was detected.

### 2.5 | Filled teeth

Any dental restorative work done exclusively as a response to decay was considered as 'filled teeth'.

### 2.6 | Missing teeth

Missing teeth was recorded if one of more teeth were not present at the time of the examination with the exception of premolars.

### 2.7 | Dental trauma

Only central and lateral incisors in the permanent dentition were considered to record dental trauma, when a tooth was either absent, fractured or discoloured indicating loss of vitality.

### 2.8 | Sealants

The presence of sealants was recorded when material placed as a preventive measure, covered the pits and fissures of the occlusal surface(s) of first and/or second permanent molars.

TABLE 1 Distribution of oral health parameters

Variables		Greece(n = 334)		Italy(n = 1228)		Spain(n = 758)	
		N	%	N	%	N	%
<b>Mouth clean frequency</b>	Once or more a day	262	78.5	1052	85.7	609	80.3
	2-6 times a week	25	7.4	139	11.3	81	10.6
	Once a week	19	5.5	12	1.0	15	2.0
	Less than once a week	14	4.3	12	1.0	11	1.5
	Not sure	14	4.3	13	1.1	42	5.6
<b>Oral pain</b>	Yes	49	14.8	225	18.3	124	16.3
<b>Edentulism</b>	Yes	2	0.6	9	0.7	10	1.3
<b>Signs of gingivitis</b>	Yes	150	61.1	744	60.6	501	66.1
<b>Untreated decay</b>	Yes	190	57.0	599	48.8	316	41.7
<b>Filled teeth</b>	Yes	202	60.4	808	65.8	422	55.7
<b>Missing teeth</b>	Yes	131	39.3	693	56.4	393	51.9
<b>Sealants</b>	Yes	22	6.5	115	9.4	394	5.2
<b>Injury</b>	Yes	60	18.1	167	13.6	139	18.4
<b>Treatment urgency</b>	Maintenance	104	31.0	481	39.2	272	35.9
	Non-urgent	180	54.0	469	38.2	328	43.3
	Urgent	50	15.0	278	22.7	158	20.7

## 2.9 | Signs of gingival disease

Free or attached gingival margins or papillae moderately red, or showing significant deviations from normal contour or texture, on three or more teeth within the mandibular area, canine to canine, was recorded as a sign of gingival disease.

## 2.10 | Treatment urgency

In absence of pain complaint, untreated decay, dental injuries and or signs of gingival disease, the athlete was recorded for maintenance follow-up. In case of absence of pain, presence of decay but not involving the pulp, defective fillings or gingival problems without abscess formation, the athlete was referred for non-urgent treatment. And finally in presence of oral pain, teeth with possible pulpal involvement, broken or missing fillings with decay or periodontal abscesses, the participant was referred for urgent treatment.<sup>12</sup>

The procedure was concluded with a personalized oral health instruction taking into account the athlete's capacity for comprehension and response.

All data collected were entered into an Excel worksheet and transferred to an SPSS data file where descriptive statistics were performed with IBM SPSS Statistics 22 software. The data regarding untreated decay and signs of gingival disease were analysed with One-Way ANOVA test to assess differences between the countries. The level of significance was predetermined at a *P* value < .05.

The samples were also divided into three age groups per country (1-17, 18-25 and 26+ years). These age groups were selected to be comparable with other international publications based on Special Smiles data.<sup>13-15</sup>

## 3 | RESULTS

A total of 2320 SO athletes participated in this study: from Greece (n = 334), Italy (n = 1228) and Spain (n = 758). The population was mainly adult; the mean age of participants was of 42.4 years (Greece), 28.8 years (Italy) and 43.3 years (Spain).

Gender distribution was similar in the three countries. The female/male ratio was similar to 40 of 60 for all the countries (38/62 in Greece, 39/61 in Italy and 40/60 in Spain)

The distribution of all the parameters in the three countries is presented in Table 1. Among the main findings, the prevalence of dental caries labelled as 'untreated decay' was 57.0% in Greece, 48.8% in Italy and 41.7% of the Spanish athletes. Half of the athletes, in general, presented at least one filled teeth while less than 10% of them presented fissure sealants. The prevalence of signs of gingival disease was 61.1% in Greece, 60.6% in Italy and 66.1% in Spain. Additionally, in Italy and Spain more than the half of the athletes had already lost a tooth. The majority of the athletes were in need of treatment (urgent and non urgent), and the prevalence of oral pain was lower than 19%, in all countries.

TABLE 2 Oral health parameters by age groups

Variables		Greece(n = 334)			Italy(n = 1228)			Spain(n = 758)		
		% >17	%18-25	%26<	% >17	%18-25	%26<	% >17*	%18-25	%26<
<b>Mouth clean frequency</b>	Once or more a day	33.3	100.0	75.5	81.3	94.4	77.6	–	100.0	77.8
<b>Signs of Gingivitis</b>	Yes	50.0	46.5	63.4	54.5	58.8	64.1	–	56.0	67.4
<b>Untreated decay</b>	Yes	50.0	46.5	58.7	46.2	48.5	49.7	–	38.1	42.2
<b>Filled teeth</b>	Yes	0	56.8	61.4	55.0	64.2	70.1	–	53.0	56.1
<b>Missing teeth</b>	Yes	0	40.9	39.4	48.9	53.4	61.4	–	39.8	53.4
<b>Sealants</b>	Yes	0	2.3	7.2	8.3	11.8	7.1	–	6.0	5.1
<b>Treatment urgency</b>	Maintenance	50.3	27.9	31.3	34.6	38.6	40.9	–	26.2	37.2
	Non-urgent	50.0	65.1	52.3	47.4	37.0	37.1	–	65.5	40.5
	Urgent	0	7.0	16.4	18.1	24.4	22.0	–	8.3	22.3

\*In the sample of Spanish athletes, there were no athletes under 17 years old.

The comparison of age groups in Table 2 showed that the prevalence of signs of gingival disease was higher than 63% in the group of 26+ years, in all three countries. In the group of 1-17 years, the prevalence of untreated dental caries was over 50% in Greek athletes, and 49% of Italian athletes had already lost a tooth.

However, no significant differences were found in mean gingival signs of disease (One-Way ANOVA,  $P = .504$ ), mean untreated decay (One-Way ANOVA,  $P = .439$ ) or need of urgent treatment (One-Way ANOVA,  $P = .12$ ) between the three countries. This result was confirmed with multiple comparisons Fisher's Least Significant Difference (LSD) test.

## 4 | DISCUSSION

The data collected in this study will be discussed from two different points of view; first, the main oral health findings regarding the overall gingival health and mouth cleaning habits, prevalence of untreated dental caries and severity of treatment need in the three countries. Secondly, Greece, Italy and Spain will be independently discussed.

### 4.1 | Oral health findings

The report of the frequency of mouth cleaning showed that the majority of the athletes reported to clean their mouth at least once a day. However, the prevalence of signs of gingival disease was also high, and no significant differences were found between the countries. Greece, Italy and Spain presented over 60% of athletes with signs of gingival disease, values that are in agreement with SO data from the UK, Nigeria and Italy and higher than Mexico, the U.S. and Venezuela.<sup>15–20</sup> The oral hygiene of

an individual with ID can be affected by many factors as previously mentioned, including an inadequate brushing technique or motor and coordination impairments.<sup>7,9,10</sup> These barriers could be overcome by the intervention or the supervision of a caregiver, who have received training in the provision of oral care.<sup>21</sup> All in all, the reported mouth cleaning frequency is encouraging as it reveals the level of athlete's awareness about the importance of oral hygiene.

Dental caries is a multifactorial disease that results from the interaction between the bacterial biofilm, the environment (e.g., diet, saliva and fluoride exposure) and the tooth structure.<sup>22</sup> As plaque control is fundamental for dental caries prevention, it is surprising that controversial results have been reported in relation to the prevalence of dental caries in population with ID. The rates of dental caries have been found to be lower or similar than in population without ID.<sup>8,23,24</sup> In this report Greece was the country with the highest percentage of untreated dental caries, reaching 57% of the screened athletes, considering lesions with a diameter of at least 0.5 mm. The evidence in this regard shows great variability with figures from 19% to 79%, in several studies from different countries that used the same protocol.<sup>15–19</sup> Another relevant aspect is the lack of fissure sealants as a preventive measure, sealants were found in less than 10% of the athletes in the three countries, evidencing a serious need of prevention. In this respect, evidence shows that the molars of children with disabilities should be sealed as it has been proven that an effective measure of dental caries prevention.<sup>25,26</sup> Besides, the population with ID and their families and/or caregivers should be educated on dietary practices and nutrition. Although the relation between oral health and diet has many interrelating factors, it is known that inadequate nutrition, a sugary diet and the consumption of sugary drinks contribute to tooth decay, tooth erosion and gingival disease.<sup>6</sup>

Finally, although reports on oral pain, present at the moment of the intervention, ranged from 14.8% in Greek athletes to 18.3% in Italian athletes, the estimated need for urgent treatment was in every sixth Greek and every fifth Italian and Spanish athlete. This figures become more relevant in a sample of athletes, since the presence of oral pain, teeth with possible pulpal involvement, broken/missing fillings with decay or periodontal abscesses may affect considerably their sport performance.

The results of this study are comparable with international data obtained with the same methodology.<sup>17,20,25,27-30</sup> Yet, the results must be interpreted with caution due to some methodology limitations.

The Training Manual for standardized oral health screenings,<sup>12</sup> is the protocol for screeners and covers education, training and test, but no statistical validation analyses were performed and, therefore, examiners can be considered trained examiners but not calibrated examiners.

Parameters like mouth cleaning habits and oral pain may be over or under-reported<sup>17,31</sup> as those were answered by athlete self-reporting. Consequently, depending on the level of comprehension, the athletes may have given the answers that seemed appropriate to them, rather than the truthful ones.

Additionally, the sample sizes obtained were convenience samples, therefore, there is chance of selection bias, and the study results cannot be extrapolated for all the population with intellectual disability (ID), because athletes who participate in SO events are a relatively younger, well-supported and high-functioning part of this population.<sup>15,32</sup>

Finally, the degree of oral disease has not been reported as the screening is intended as a first step into exposing the prevalence of oral disease among this group of population for several reasons. First, the dichotomous nature of the variables made it impossible to report the severity of disease per parameter. Second, the assessment was visual and did not include the use of explorers nor radiographies. Third, limited parameters were assessed in the oral screening; plaque index, periodontal status and devices used for oral hygiene, among others, were not included.<sup>18</sup> Finally, It has to be noted that no information was recorded as to whether the athletes took any medication. It has been shown that long-term intake of medication such as psychotropic drugs may show significant decrease in the salivary flow rate, which would favour the development of rampant caries, gingival and soft tissues diseases.<sup>33-34</sup>

## 4.2 | Southern Europe

Across the 27 European Union (EU) member countries, there is no common plan to handle the oral health needs of

the population. It has been published that in 2001 roughly 60% of Europeans had visited a dentist in the previous 12 months. In Southern Europe not even half of the population visited the dentist on a regular basis (Italy 51.3 %, Spain 41.7 %, Portugal 35.5 % and Greece 48.6 %). On the other hand these numbers were evidently higher in other countries of the EU like Germany (73.3 %), the Netherlands (81.0 %) and Luxembourg (79.7%).<sup>35</sup> According to the last updated data from Eurostat (Eurostat, 2015), the number of practicing dentists per 100 000 inhabitants remained relatively unchanged in most of the EU member states between 2009 and 2014. Italy registered an increase of 24 % of professionally active dentists, Spain an increase of 23 %, while Greece registered a reduction of 4% of dentists licensed to practice.

## 4.3 | Greece

According to the Organization for Economic Co-operation and Development (OECD), the total health expenditure in Greece as a percentage of GDP (2013) is 9.2%. Further, the Greek Ministry of Health and Social Solidarity reports that 1.1% of the GDP is spent on oral health care, and 95.7% of oral care is covered by private finance. Comparable percentages of GDP are spent on oral health care in two other EU countries: Cyprus (2007, 0.97 %) and Italy (2004, 0.97 %). This, in addition to the high costs of oral care, low expenditure in public oral care and the absence of private dental insurances illustrate some of the barriers to the access to oral care in Greece.<sup>35</sup>

According to a study performed on Greek dentists who attended to an annual national scientific congress, less than 40% of the dentists have been trained for the treatment of people with disabilities. In consequence, paediatric dentists mostly deliver oral care for this population.<sup>36</sup>

In terms of infrastructure, there are few public hospitals that offer intravenous sedation and general anaesthesia as a treatment choice, and Greek dentists are not allowed to practice any form of sedation, including N2O in private practice, except in specially licenced day-care surgery centres that are practically non-existent.<sup>36</sup> This creates one more barrier to care for people with severe IDs to a higher degree because they are more likely to require stabilization, sedation or general anaesthesia.

In oral care, professional prophylaxis is the first most frequent performed treatment and tooth fillings the second. Further, the oral hygiene of Greek adolescents and young adults with disabilities has been found to be poor. Parents' report showed that 66% of them brush their teeth at least once per day and 50% of them without parental supervision.<sup>37</sup> The lack of supervision is mentioned as an explanatory factor for signs of gingival disease despite of



the high frequency of mouth cleaning which is comparable to the one found in this study (78%).

Dental caries prevalence has been reported to be higher in Greek teenagers with ID<sup>37,38</sup> compared to adolescents without disability (Hellenic Dental Association, 2005). Therefore, it is expected that preventive treatments are an important part of the dental care in this group of patients. Nevertheless, it has been reported that 48.1% of Greek dentists have never placed a fissure sealant.<sup>37</sup> This fact could explain the lower prevalence (6.5%) found in the results of the present study even though evidence supports their importance in dental caries prevention.<sup>36</sup>

Our results point to a high need for oral treatment among Greek athletes with ID. Given the large number of variables that contribute to their oral health Status and barriers for the access to oral health, the present work did not address all contributing factors. However, the findings are intended to motivate the assessment of the oral care for people with IDs.

#### 4.4 | Italy

Italy is a country with a population of 60 990 000 (2013) and the total expenditure on health as a percentage of GDP (2013) of 8.8%, similar to the data of Greece and Spain.

In Italy more than three million of individuals have a disability (4.8% of the entire population), and approximately 190 000 of them live in residential Institutions.<sup>19</sup> The oral health condition of institutionalized individuals with disabilities has been reported to be poor with a high prevalence of dental caries and periodontal disease. In a study on institutionalized population of Italian adults with mental retardation, the DMFT score was registered, and 'missing teeth' was the predominant part of the index while the score for 'filled teeth' was almost non-existent.<sup>39</sup>

Few Italian dentists offer oral care for people with disabilities, due to lack of experience with disabled patients, complexity of management, limited reimbursements and lack of financial incentives. In addition, Italian dental students receive poor training in oral care for individuals with ID, which is not part of the official study programs.<sup>19,40</sup> A study performed in 65% of the Italian dental schools showed that dental students considered themselves unprepared to provide oral care to population with disabilities while more than 50% of them were interested in learning more in order to be better prepared to treat special patients.<sup>19</sup>

An article with data collected during three consecutive Italian SO National Games - Fiuggi (FR) 2003, Rome 2004 and Rome 2005 - has been published.<sup>19</sup> According to this study, 77% of the participants reported cleaning their mouth at least once daily, parameter that seems to have

slightly improved as in our study 85.7% of the athletes reported to clean their mouth at least once a day. Similar values were found regarding oral pain and signs of gingival disease. While 50% of the athletes required urgent treatment, in our study that value has decreased to 22%. Since the registered parameters seem to have improved over time, this improvement may be related to the positive impact of Special Smiles program on the oral health of SO athletes. The program actually provides not only education on oral hygiene but also makes families or tutors aware of the oral needs of the athletes and refers them to oral care providers when needed.

Nevertheless, the challenge in Italy remains to be how to ensure an effective oral healthcare for this sector of the population, with appropriate access to oral care and trained care providers.

#### 4.5 | Spain

According to the data published by the OECD the total expenditure on health per capita (2012) in Spain is of USD 2998, and the total expenditure on health as a percentage of GDP (2012) is about 9.4%.<sup>2</sup>

About a 15% of the population suffer from some kind of disability.<sup>41</sup> The rate of people with ID among the population between 6 and 64 years of age is 9.38 per 1000 according to the disabilities, deficiencies and health status survey of 1999.<sup>42</sup> The most prevalent of those are Down syndrome, idiopathic developmental delay and mental retardation associated with cerebral palsy.<sup>22</sup>

The public health services in Spain are decentralized, and as a consequence, the access to health care for patients with special needs varies within the same country. However, dental care is not covered by the Spanish public health system with exception of tooth extractions, becoming one of the most important barriers to the access to dental treatment for patients with special needs.<sup>22,43</sup>

An article published in 2002 studied the prevalence of dental caries among Spanish adult population with ID by means of DMFT scores. The recorded DMFT = 8.69 was significantly lower than the national average (DMFT = 10.9) for similar age groups (35-44 years). Moreover, the amount of filled teeth was very low in comparison with that in the rest of the population.<sup>22</sup> In agreement to the above, in our study Spain was the country with the lowest prevalence of untreated decay and filled teeth. This could be a consequence of the lack of coverage for oral care in public health services, where for patients could be more likely to experience extractions rather than restorations in response to dental caries.

Finally, the oral health needs of the population with special needs as exposed in a descriptive study from

the University of Madrid, include mainly conservative dentistry (90.30%) and periodontal treatments (76.25%).<sup>41</sup>

This work found that people with ID from South European countries face similar oral health problems. The reported oral needs of Greek, Italian and Spanish athletes may be reflecting a lack of national policies regarding the oral health of people with disabilities and limited resources available.

To face the oral health needs of people with ID, these countries should focus on the reimbursement for dental care services and training of dentists. All three countries show a very limited coverage for conservative and periodontal treatments. Public finance programs could attract more dentists to provide care for people with ID to increase the amount of practitioners able to deliver oral care to this population.

Furthermore, It is recommended that the authorities responsible for dental care services of Southern European countries develop adequate national databases and develop preventive programs as cost-effective measures to improve oral health.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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