Oral Health Status, Malocclusions and *S. Mutans* Counts in Children with Down's Syndrome*

*Agim Begzati,[1] Kastriot Meqa[2]**, Blerta Xhemali-Latifi[1], Teuta Kutllovci[1], Merita Berisha[3]*

1. Associate Professor, Department of Pedodontics, School of Dentistry, Medical Faculty, University of Prishtina, Prishtina, Republic of Kosovo.
2. University Assistant, Department of Periodontology and Oral Medicine, School of Dentistry, Medical Faculty, University of Prishtina, Prishtina, Republic of Kosovo.
3. Associate Professor, Department of Statistics, Medical Faculty, University of Prishtina, Prishtina, Republic of Kosovo.

Abstract

Down syndrome (DS), as a genetic disorder, has been known as a contributing factor increased prevalence of oral cavity's diseases, such malocclusions, soft tissue disorders and periodontal involvement, but surprisingly not to dental caries experience. This group of subjects has been the target of our investigation regarding the dental caries, malocclusions and periodontal status. The aim of this study was to evaluate the prevalence of caries, the presence of malocclusions, oral hygiene index, and the level of cariogenic bacteria, among children with Down's syndrome (DS) in Kosovo.

Sixty-five children with DS were examined for dental caries, orthodontic anomalies, oral hygiene and periodontal status. Caries experience was determined using dmft/DMFT indexes according to the WHO criteria. The OHI was determined using the Plaque Test. To determine the presence of S. mutans, the CRT bacteria test was used.

The total mean DMFT of 3.82 was recorded, with no significant difference between gender. A higher DMFT was found in the age group 12-18 years of DS children. Subjects with CFU>10^5 had higher DMFT. Gingivitis was present in 65% of the subjects. The prevalence of periodontal disease was 43%, while the OHI-index of grade 3 was found in 18,5% of subjects. More than half of the examined DS children had one of malocclusions, e.g., hypodontia. Periodontal treatment is not evident. The low caries treatment was found with 74% of the DMFT structure belonging to the untreated caries.

Low level of the oral status of the DS children should raise the awareness of the dentistry policy makers to undertake stronger measures in dealing with this category of children.

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Introduction

Based on the etiology and clinical symptoms, there are some definitions for Down Syndrome. In general, these definitions are similar. According to Hennequin, Down syndrome (DS) is an autosomal chromosomal disorder caused by trisomy of all or a critical part of chromosome 21.[1] DS described as a congenital autosomal anomaly, also called trisomy 21, is a genetic alteration characterized by generalized growth and mental deficiency.[2]

The clinical description of children with this syndrome was given very early, in 1866, by John Langdon Down.[3] Although the etiology of the syndrome remains incompletely clarified, however, from many years ago was reported that DS primary cause due to trisomy 21.[4]

A review from the literature shows that DS affects approximately 1 in 600-700 live births globally.[5] Almost the same, are the data of author Sherman, who has found that in USA DS has been estimated to occur in approximately 1 in 732 infants.[6]

Down syndrome patients are characterized by short stature, distinctive orofacial features with protruding tongue and

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***Corresponding author:**
Kastriot Meqa
Department of Periodontology and Oral Medicine,
School of Dentistry, Medical Faculty, University of Prishtina,
Lagja e Spitalit Str, NN, Prishtina, Republic of Kosovo
E-mail: kastriot.meqa@uni-pr.edu

learning difficulties. Some of the common oral findings in these children include open bite, macroglossia, fissured lips and tongue, delayed eruption of teeth, dental anomalies, malocclusion, poor oral hygiene and a low caries experience.[2,7,8]

Except for dental anomalies and orofacial dysmorphology, this syndrome is also associated with neurological changes, generalized hypotonia, congenital heart disease, gastrointestinal disorders, respiratory problems, a greater risk of infection, and other features.[5,10-13]

Oral problems in these children are the same as in the general population. However, they differ in prevalence and clinical condition. Periodontitis, dental caries, and orthodontic anomalies are health problems that need to be taken into consideration.

Data from the literature show that children with DS had a high prevalence of gingivitis and periodontal disease, loss of attachment in form of gingival recession and increased pocket depth, alveolar bone loss, increased tooth mobility, and even loss of teeth as e result of rapid and generalized periodontal destruction.[14]

Children with DS characterized with frequently dental anomalies: hypodontia, microdontia (small and short crowns), anterior open bite and posterior crossbite.[15]

Dental caries remains one of the most frequent childhood diseases, despite an overall global decline of its prevalence. According to US National Institutes of Healthcaries is one of the most common diseases of the oral environment, affecting 20% of the children aged between 2 and 4 years and more than three-quarters of the human population over 18 years of age.[16]

But, in underdeveloped and low-economic countries, such as Kosovo, the caries prevalence is enormously high. Epidemiological data derived from the Oral Health Promotion Group of Kosovo showed a high prevalence of dental caries among preschool children in Kosovo, with 89.2% and the mean dmft index of 5.6.[17] ThisGroup has also included the children with Down Syndrome in their activity.

Studies from the literature show that the oral health problems observed, especially dental caries, in these patients show some differences compared with the general population. Various studies have shown a reduced prevalence of caries in DS children when compared with otherchildren (without Down Syndrome).[18-21]

Author Randell has reported that young DS children had prolonged use of a bottle as a result of feeding problems or behavioral difficulties, with increased risk of developing early childhood caries.[22]

Some others studieshave found the opposite conclusions, the prevalence of caries in healthy children compared to children with DS is same, and sometimes even higher. Nonetheless, several studies have found that people with and without DS share the same caries rates while other studies have reported higher caries rates in those with DS.[23]

Based on the data from the literature, we have decided that in the assessment evaluation of oral health to include the determination and role of the cariogenic bacteria, *S. mutans*, and its relationships with caries experience.

Therefore, the aim of this study was to evaluate the prevalence of caries, the presence of malocclusions, oral hygiene index, and the level of cariogenic bacteria, among children with Down's syndrome (DS) in Kosovo.

Materials and methods

Children with Down Syndrome (DS) of both sexes, 6-18 years old, were included in the study. The study was conducted in the Center for Care for Children with Down syndrome in Prishtina, Kosovo. Clinical examination was performed in 65 children and the dmft/DMFT indexes were determined according to the WHO criteria. Each child was examined under natural light using a mirror and probe. Dental anomalies were recorded during the examinations and referring to the radiographs. Radiographs of 22 patients were taken in the University Dentistry Clinical Center, who in the meantime were treated in the clinic. The OHI was determined using the Plaque Test (Ivoclar/Vivadent) according to the Greene-Vermilion index.

Bacterial sampling

To determine the presence of *S. mutans*, the CRT bacteria test (Caries risk bacteria test, Ivoclar/Vivadent), was used. Due to deficiencies of the DS subjects, such as children's age, the absence of chewing, swallowing, and expectoration reflexes, the modified spatula method was used in these subjects. Bacterial counts were recorded as colony forming units per milliliter (CFU/mL) of saliva. The number of bacterial colonies was graded as follows: Class 0

and Class 1 (CFU < 10^5/mL saliva), and Class 2 and Class 3 (CFU ≥ 10^5/mL saliva), according to the manufacturers' scoring-card (Ivoclar-Vivadent, Lichtenstein).

Informed consent was obtained from parents of children with Down syndrome who participated in the study.

Results

A total of 65 children with Down syndrome (34 female and 29 male) were examined. The mean DMFT for females was 3.80, while for males 3.84, with total mean DMFT of 3.82. There is no statistical significance of DMFT according to the gender (p>0.05). (Table 1)

Gender	N	%	DMFT	P value
M	34	100.0	3.84	
F	29	93.5	3.80	p>0.05
Total	65	100.0	**3.82**	

Table 1. DMFT in children with Down syndrome according to gender.

According to the age groups, low caries experiences (mean DMFT) was seen in the age group 6-12 year, 2.6. The age group of 13-18 year showed the highest mean DMFT, 4.7. There is a significant difference of DMFT according to the age groups for p<0.0001. (Table 2)

Age group	N	%	Mean DMFT ± SD	t-test; P value
13-18 year	38	58.5	4.7±1.5	t = 5.3 ; df= 63; p<0.0001
6-12 year	27	41.5	2.6±1.7	
Total	62	100.0	3.8±1.9	

Table 2. DMFT in children with Down syndrome according to age groups.

Classes	N	%	DMFT	F; p value
0	5	7.7	2.0±1.0	F=1.83 ; df=64; p=014
1	11	16.9	3.8±0.87	
2	25	38.5	4.0±1.8	
3	24	36.9	4.0±2.2	
Total	65	100.0	3.8±1.8	

Table 3. Classes of *S. mutans* and mean DMFT.

In the table 3 are presented the results of *S. mutans* distribution according to the classes and its association with DMFT index. Low DMFT was found at the children with Down syndrome, where *S. mutans*was determined of the class 0. In other classes (1, 2, 3), we found almost the same values of mean DMFT. So, there is not a statistical significance of DMFT according to the classes of *S. mutans* distributions (F=1.83, p=014). (Table 3)

Caries risk is expressed by CFU (Colony forming units) values, shows that 16 of children with DS exhibited a low level of *S. mutans* colonies (CFU < 10^5), with the mean DMFT of 3.3. The groups with higher CFU of *S. mutans* (Classes 2 and 3), representing 75% of the DS children, had a mean DMFT of 4.0. Comparing the mean DMFT of DS children by *S. mutans* classes of CFU does not show a statistical significance of DMFT according to the CFU of *S. mutans* (T=1.32, p>0.05)(Table 4)

CFU	N	%	DMFT	p value
0 & 1 (CFU<105)	16	24.6	3.3±1.2	t=1.32;
2 & 3 (CFU>105)	49	75.4	4.0±2.0	Df=63;
Total	65	100.0	3.8±1.8	P>0.05

Table 4. Colonyformingunit (CFU) counts for *S. mutans* and mean DMFT.

The comparison the CFU values of *S. mutans* by age group did not show the statistically significant difference of CFU distributionat the both age groups of children with Down syndrome (X^2=0.043, p>0.05). (Table 5).

S mutans CFU	6-12	13-18	Total	Chi squared test; p-value
0 & 1 (CFU<10^5)	9	7	16	X^2= 0.043;
2 & 3(CFU>10^5)	29	20	49	Df=1; P>0.05
Total	38	27	65	

Table 5. *S. mutans* according to CFU and age groups.

The mean plaque test was 1.47. The DS children recorded with OHI-1 were 40, with mean DMFT of 3.4. Mean DMFT of 4.2was found in children with OHI-2, while in the DS children with OHI-3 the mean DMFT was 4.9. There is a statistically significant difference of DMFT with regards to the OHI index (F = 3.67, *P* = 0.031). (Table 6).

OHI	N	%	Mean DMFT	One-Way ANOVA
1	40	61.5	3.4±1.8	
2	13	20.0	4.2±1.8	F=3.672
3	12	18.5	4.9±1.6	p=0.031
Total	65	100.0	3.8±1.9	

Table 6. OHI Index and mean DMFT.

Dental anomalies in children with DS are presented in table 57. Hypodontia was present in 52% of the examined subjects. Hypodontia of the

lateral maxillary incisors (25%) and permanent mandibular premolars (20%) were the more dominant anomalies. The absence of some of the3rd molars was 63%, and in half of the subjects were absent of all third molars. Of the occlusal anomalies recorded, the most frequent were mandibular prognathism (48%), and anterior cross-bite (37%). Periodontitis was accounted for 28 DS children, while gingivitis was recorded in 42 of them. There were six children who lost their teeth due to periodontitis.(Table 7).

	N	%
Dental anomalies		
Hypodontia	34	52%
Supernumerary	3	5%
Transposition	8	12%
Third molar agenesis	41	63%
Occlusal anomalies		
Mandibular prognathism	31	48%
Anterior crossbite	24	37%
Anterior openbite	16	25%
Posterior crossbite	10	15%
Periodontal disease		
Gingivitis	42	65%
Periodontitis	28	43%
The tooth loss due to periodontitis	6	9%

Table 7. Distribution of orthodontic anomalies and periodontal disease in patients with DS.

Discussion

Patients with DS in Kosovo compared to younger group age have lower caries experience. In a previous study from our Department, we found that the age group of 7-14 years of non-DS children had higher DMFT (4.8) compared to DS children of age group 6-12 years (DMFT 2.6). The data from the literature also report a lower caries prevalence in DS children compared to healthy non-DS children.[18-20]

A suggestion to this may be as a result of frequent tremata of the dentition, hypodontia, smaller teeth, delayed eruption and shallow fissures in premolars and molars. According to a study from Siqueira et al. the lower caries prevalence may be due to increased salivary buffering capacity in DS children compared with healthy individuals of the same age.[24]

The most concerning part of the care for these children is the high level of untreated teeth, comprising 74% of the DMFT structure. A similar situation is found also in non-DS children (77%). (Table 8)

	Decayed (D)	Missing (M)	Filled (F)	Total
Mean DMFT	2.8	0.8	0.2	3.8
Percent	74%	21%	5%	100%

Table 8. Comparison of DMFT structure among children with DS.

The difference is regarding the extracted teeth, with 11% at non-DS children and 21% of DS children. (Begzati et al. 2011)

Regarding the possible correlation between *S. mutans* CFU counts and caries experience, even though no significant statistical difference was found, the results of our study show that in the higher CFU counts' children ($CFU>10^5$), DMFT was higher – 4.0, while in children with low CFU count of S. mutans ($CFU<10^5$), DMFT was 3.3.

Reports from the literature have concluded that in children with DS the lower caries rates was associated with lower levels of *S. mutans* in saliva.[25]

At least one orthodontic anomaly was recorded in all of the examined children. Hypodontia was recorded as the most dominant dental anomaly, found in 52% of DS children. On the other hand, mandibular prognathism was the most dominant occlusal anomaly, found in 48% of DS children. The radiological examination revealed the third molar agenesis in 63% of these subjects. A high prevalence of orthodontic anomalies, such as in number, morphology, and size, is described also in the relevant literature.[26,27] According to Oredugba's report, the most common dental malocclusions in DS children are of class III.[28]

The oral hygiene index in DS children was very high, 1.6. It is associated with the negligence of oral hygiene, where 55% of them do not brush their teeth at all. Gingivitis was present in 65% of the subjects, while periodontal disease had affected nearly 44% of DS children, of the age group 12-18 years old. In 9% of cases, tooth loss due to periodontal disease was found. The data from the literature also show a high

prevalence of gingivitis and periodontal disease, spanning from 40%, in younger DS children, to 100% in 30 years old DS subjects.[29]

Even though in the DMFT structure there was no correlation found between the caries intensity and CFU counts, a statistical difference was found when comparing CFU counts and gingivitis. In 42 children with gingivitis, a high CFU count was recorded in 90% of cases. From our previous study (Begzati et al.), we found that chlorhexidine gel application decreases quite well the gingival bleeding (a clinical sign of gingivitis), but also reduces the *S. mutans* levels in saliva. Thus, the preventive application of chlorhexidine may lower the prevalence of gingivitis, as well as periodontitis.

Conclusions

Based on our results, we have found that the overall oral health of children with Down syndrome is very poor. There should be a firmer support from the society, starting with the education and continue further with the active preventive measures.

Despite slight low values of DMFT index in children with Down syndrome, they raise concern, the especially high rate of untreated teeth. High OHI index and *S. mutans* counts associated with periodontaldisease involvement andhigh prevalence of dental anomalies require serious preventive approach towards this population group closely involving the dental society. Use of fluoridation varnish application, because of caries, and of chlorhexidine, because of periodontal disease, would be useful.

Declaration of Interest

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