Prevalence of Dental Caries, Salivary Streptococcus Mutans, Lactobacilli Count, pH level and Buffering Capacity among children with Down's Syndrome in Al-Qassim Region, KSA

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ABSTRACT

Introduction: Oral manifestations in Down's syndrome DS children include particular features that must be taken into consideration in the routine follow-up and maintenance of these patients. Aim of the study was to determine the prevalence of dental caries, the salivary S. mutans and lactobacilli counts, pH level and buffering capacity in Down syndrome children compared to non-Down syndrome children living in Al-Qassim Region, KSA.

Material and Methods: The Study was performed on 121 Children, aged between 6-12 years old in Al-Qassim Region, KSA. The control group consisted of 85 male children without DS and the test group with DS consisted of 36 children. The criteria tested were: Caries prevalence, S mutans and Lactobacillus count, pH and buffering capacity.

Results: There was no statistically significant difference between the children having Down's syndrome and normal children regarding the prevalence of dental caries in both primary and permanent teeth. Regarding the Streptococcus mutans and lactobacilli count, a highly statistically significant difference was detected where the DS children with caries present in permanent teeth have both high Streptococcus mutans and lactobacilli count more than 10^5(CFU). With regard to the relationship between the buffering capacity and presence of caries in both primary and permanent teeth there was no statistically significant difference between the children with Down's syndrome with medium or high buffering capacity. According to the pH level, there was a high statistical significance that the normal children have lower PH level than the DS children.

Conclusion: Children with DS in Al-Qassim Region have no difference regarding the prevalence of dental caries in both primary and permanent teeth compared to children without Down syndrome.

Keywords: Dental caries, Down's syndrome, Buffering capacity, Saliva, PH level, Streptococcus mutans, lactobacilli, Saudi Arabia, Al-Qassim.

INTRODUCTION

Down's syndrome or DS, also known as trisomy 21 is a genetic disorder caused by the presence of all or part of a third copy of chromosome 21.[1] It is typically associated with physical growth delays, characteristic facial features, and mild to moderate intellectual disability.[2] The estimated incidence of Down syndrome is between 1 in 1,000 to 1 in 1,100 live births worldwide. Each year approximately 3,000 to 5,000 children are born with this chromosome disorder.[3] In Saudi Arabia, there is a relatively high incidence of Down's syndrome. The incidence has been reported as 1 in 554 live births.[4] Children with DS have common oral disorders, including malocclusion, mouth breathing, macroglossia, periodontal disease, missing and malformed teeth, delayed teeth eruption, microdontia, diastema and bruxism. Also, there are many other dental manifestations such as Enamel hypocalcification and hypoplasia, taurodontism, V-shaped palate, incomplete development of the mid-face complex and absent incisors make articulation difficult.[5] Results are conflicting regarding prevalence of dental caries in the population with DS creating difficulties to reach firm conclusion. Many studies reported a low level of dental caries in patients with DS as compared to groups without DS.[6,7] On the other hand, other studies showed no differences in caries prevalence between individuals with and without DS.[8,9] Authors have also reported a high correlation between caries prevalence and salivary mutans streptococci and lactobacilli counts.[10,11] Studies of the salivary levels of S mutans in DS patients showed controversial results. Some authors have found lower salivary mutans streptococci (MS) count in DS children when compared to their non-DS siblings.[12] Other authors report no differences between the levels of (MS) in individuals with and without DS.[13] Additionally, other studies had reported higher (MS) counts in the saliva of DS children than in non-DS children.[14] In addition to microbiological factors, many other salivary elements are also involved in the incidence of caries. Salivary pH and buffering capacity play an important role in caries development.[15] The aim of this study was to determine the prevalence of dental caries, salivary mutans streptococci and lactobacilli counts, pH level and buffering capacity in Down syndrome children aged between six and twelve years old compared to non-Down syndrome individuals living in Al-Qassim Region, KSA.

MATERIAL AND METHODS

This study was approved by the Dental Ethics Committee and Dental Students' Research Facilitation Committee in "College of Dentistry, Qassim university". For the non-Down syndrome children, the authorities of the selected schools were contacted to seek their permission.

After that, the informed consent of all participating children

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P value	Normal Children (N= 85)	DS Children N= (36)	
0.061	68 80.0%	(23) %63.9	Caries Free in Permanent teeth
	17 20.0%	13 %36.1	Caries Present in Permanent teeth
0.189	9 10.6%	7 19.4%	Caries Free in Primary teeth
	76 89.4%	29 80.6%	Caries Present in Primary teeth
"Chi square test" (p>0.05)			

Table-1: Prevalence of caries in DS and Normal Children in Both Primary and Permanent teeth.

P value	Caries Present in Permanent Teeth	Caries Free in Permanent Teeth	N= 36))
P<0.001*	0 0%	17 68%	Low S. mutans (count)
	11 100%	8 32%	High S. mutans (count)
P<0.001*	0 0.0%	15 %60	Low lactobacilli (count)
	11 %100	10 %40	High lactobacilli (count)
"Chi square test" (p<0.001)*			

Table-2: Caries in Permanent Teeth in DS children and S. Mutans and lactobacilli (count).

was obtained from the parents through a letter sent to them through schools. For the children with Down syndrome, the permission was obtained from the managing director of Al-Juffali center to provide a clinic and schedule an appointment for the examination of DS children after obtaining an informed consent from the parents by a letter sent to them by the (Patient affairs Committee) in Al-Juffali center. After performing clinical examination, parents or guardians were informed about the oral health needs of their children and referred for treatment, when necessary, to the Faculty of Dentistry, Qassim University.

Study design and sampling: Cross sectional study was performed.The sample included 121 Children aged between 6-12 years old in Al-Qassim Region, KSA divided into two groups. The control group consisted of 85 male children without DS selected randomly among students from primary schools in Al-Qassim region and the test group with DS consisting of 40 children were selected randomly from Al-Juffali center in Unaizah, Qassim Province. Four children did not cooperate with the examination, so they were excluded from the study. The final sample size of examined DS children was 36 children. Al-Juffali center was selected because it is the only facility in Al-Qassim Region that is specialized in treatment and rehabilitation of patients with mental retardation. The inclusion criteria implemented were: participants had not taken antibiotics for at least two months prior to the study, when antibacterial mouthwash is used at least 12 hours should pass before the saliva collection and examination. Exclusion criteria were: use of orthodontic appliances and failure to cooperate with the clinical examination.

All the data collected from the dental examination were arranged and tabulated in individual form for each patient composed of the patient's name, gender, age, dental chart.

Clinical examination: The examination had been carried out by the same examiner to avoid the intra-examiner bias. The diagnosis of caries was based on the detection of carious lesions at the cavitation stage, as recommended by the World Health Organization.[3] DMFT and the number of decayed, missing and filled primary teeth (dft) were recorded. The examination was done with standard dental examination instruments (mirror and WHO probe). No radiographs were taken. All the instruments were sterilized and packed.

Collection of salivary samples and microbiological analysis: Each participant was instructed not to eat or drink before sample collection. For the salivary microbiological test CRT® bacteria kit by Ivoclar Vivadent was used. The saliva was collected by small pipe tool from suitable container i.e., the patient spit inside it after the stimulation of salivation by chewing enclosed paraffin wax pellet. Then the surfaces of the two agars were wet thoroughly with saliva using the pipe. Then the agar carrier was positioned back into the vial and sealed. After that, we placed the vial upright in the Cultural/Ivoclar Vivadent incubator at 37 °C / 99 °F for 48 hours. After removal of the vial from the incubator, we compared the density of the mutans streptococci and lactobacilli colonies with the corresponding evaluation form. The name of the child was marked on the top of the vial. For the buffering capacity and pH level, the CRT® buffer strips by Ivoclar Vivadent was used. All of these variables were used in the statistical analysis.

Data analysis: Statistical analysis was performed by using the software program SPSS 22.0 for Windows; SPSS Inc, Chicago, IL).

RESULTS

Statistical analysis in table-1 revealed that, of the 36 DS children 63.9% were caries free in permanent teeth, while 80% of normal children had no caries in permanent dentition. In primary teeth, 80.6% of DS children had active caries comparing to their counterpart group which had 89.4% with caries in primary teeth. There was no statistically significant difference (p>0.05). Regarding the S. mutans and lactobacilli count (table-2), 100% of DS children with presence of caries in permanent teeth had both high S. mutans and Lactobacilli count more than 10^5(CFU). In caries free group, 68% had low S. mutans count and 60% had low Lactobacilli count less than 10^5(CFU). The statistical analysis revealed a highly statistical significant difference (p<0.001).

Table-3, revealed that, the majority of children having active carious lesions in primary teeth were having high bacterial counts for both S. mutans and Lactobacilli (55.2% and 62.1% respectively) with no statistical significant difference (p>0.05).

In permanent teeth of normal children (table-4), 64.7% of caries free group had low S. mutans count and 52.8% of the sample with dental caries had high S. mutans count. No statistically significant difference was detected. Regarding Lactobacilli count, 88.2% of dental caries positive sample had high Lactobacilli count with no statistical significant difference.

In the Primary teeth of normal children 77.8% of caries free group had low S. mutans count and 40.8% of caries positive

P value	Caries Present in Primary Teeth	Caries Free in Primary Teeth	N= 36))
0.558	13 %44.8	4 57.1%	Low S. mutans (count)
	16 55.2%	3 %.942	High S. mutans (count)
0.355	11 37.9%	4 57.1%	Low lactobacilli (count)
	18 62.1%	3 %.942	High lactobacilli (count)
"Chi square test" (p>0.05)			

Table-3: Caries in Primary Teeth in DS children and S. Mutans and lactobacilli (count).

P value	Caries Present in Permanent Teeth	Caries Free in Perma-nent Teeth	(N= 36)
0.276	8 47.1%	44 64.7%	Low SM(count)
	9 52.8%	24 35.3%	High SM(count)
0.113	2 11.8%	21 30.9%	Low lactobacilli (count)
	15 88.2%	47 69.1%	High lactobacilli (count)
"Chi square test" (p>0.05)			

Table-4: Caries in Permanent Teeth in Normal children and S. Mutans and lactobacilli (count).

P value	Caries Present in Primary Teeth	Caries Free in Primary Teeth	(N= 85)
0.280	45 59.2%	7 %77.8	Low S. mutans (count)
	31 %40.8	2 %22.2	High S. mutans (count)
0.042*	18 %23.7	5 55.6%	Low lactobacilli (count)
	58 %76.3	4 %44.4	High lactobacilli (count)
"Chi square test" (p<0.05)*			

Table-5: Caries in Primary Teeth in Normal children and S. Mutans and lactobacilli (count).

P value	Caries Present	Caries Free	
0.609	8 %72.7	16 %64.0	Medium (BC)
	3 %27.3	9 %36.0	High (BC)
Caries in Primary Teeth in DS children and Buffering Capacity.			
0.137	21 72.4%	3 42.9%	Medium (BC)
	8 27.6%	4 57.1%	High (BC)
Caries in Permanent Teeth in normal children and Buffering Capacity. (N=85)			
P<0.001*	12 70.6%	18 26.5%	Medium (BC)
	5 29.4%	**50 73.5%**	High (BC)
Caries in Primary Teeth in normal children and Buffering Capacity.			
0.179	25 32.9%	5 55.6%	Medium (BC)
	51 67.1%	4 44.4%	High (BC)
"Chi square test" (p<0.001)*			

Table-6: Caries in Permanent Teeth in DS children and Buffering Capacity. (N=36)

group had high S. mutans count with no statistical significant difference. Regarding Lactobacilli count (table-5), majority of children with caries present 76.3% had high Lactobacilli counts with statistical significant difference (p<0.05).

Regarding the relationship between the buffering capacity and presence of caries in both primary and permanent teeth (table-6), there was no statistically significant difference (p>0.05) between the DS children with medium or high buffering capacity. In normal children there was no statistically significant difference between the children with or without caries in deciduous teeth and the buffering capacity. In contrast, a highly statistically significant difference (p<0.001) proved that the normal children with high buffering capacity have low prevalence of caries in permanent teeth.

Regarding the pH level (table-7), there was a highly statistical significant difference in the mean salivary pH among the DS children. DS Group had a higher mean salivary pH value (Mean=7.367 ± 6485) than that of Normal children.

DISCUSSION

There is a split decision regarding caries prevalence in children with Down's syndrome compared with normal children. Some authors indicated that DS children have Lower caries prevalence compared to normal counterpart children. On the other hand, other researchers showed higher prevalence of caries in DS children in comparison to normal group.

The present study revealed that there was no statistically significant difference between the DS and normal Children regarding the prevalence of dental caries in both primary and permanent teeth (p>0.05). This is in agreement with other studies that there is no difference in caries prevalence between individuals with and without DS.[5,8,14] Although some studies in the literature had found a lower prevalence of dental caries in DS children.[21,2,23] In contrast, other researchers showed higher prevalence of caries in DS children in comparison to normal group.[15,16] Possible reason for the inconsistency in the results of these studies is that only a few previous researches have evaluated the prevalence of dental caries in DS individuals comparing to normal counterpart children.

Regarding the Streptococcus mutans and lactobacilli count, this study showed that there was a highly statistically significant difference (p<0.001) in the DS children with caries present in permanent teeth having both high Streptococcus mutans and lactobacilli count more than 10^5(CFU). Also, there was statistically significant difference (p<0.001) in the DS children without caries in permanent teeth having both low Streptococcus mutans and lactobacilli count less than 10^5(CFU). Other authors reported that DS children showed lower counts of mutans streptococci in parallel with a higher caries-free rate, despite evidence of hyposalivation.[24]

According to the pH level, there are many conflicting studies regarding the salivary pH of children with DS in comparison to normal children. The current study showed that DS Group had

P value	Std. Deviation	Mean	N	DS or Normal children
P<0.001*	.64850	7.367	36	PH level in DS Children
	.56030	6.856	85	PH level Normal Children
"Independent T test" (p<0.001)*				

Table-7: PH level in DS and normal children.

a higher mean salivary pH level than the mean of normal group. Some researchers found that, there was no difference between the DS and normal children in salivary pH level.[17,24,28-30] Others found that, the pH level in DS children was higher than the normal group[31] and some reported a lower pH level in DS.[32]

Regarding the relationship between the buffering capacity and presence of caries in both primary and permanent teeth, the present study showed that, there was no statistically significant difference ($p>0.05$) between the DS children with medium or high buffering capacity. This is in agreement with others studies which reported that there was no direct impact of the Buffering capacity and the presence of caries.[33-35]

CONCLUSION

In conclusion, this study revealed that there was no statistically significant difference between the DS and normal Children regarding the prevalence of dental caries in both primary and permanent teeth **($p>0.05$)** in Al-Qassim Region.

This study recommend that oral health care and promotion programs should be conducted in special needs schools and centers with family health education as an important part of such programs.

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